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Imperial Agricultural Bureaux

Seventh Annual Report

OF THE

Executive Council

1935-1936

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IMPERIAL MYCOLOGICAL INSTITUTE 9 OCT. 1936

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1936

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PREFACE

Many delegates to the Imperial Agricultural Research Conference, 1927, especially those from Overseas, stressed the difficulties they had experienced in obtaining information in different countries of research in various branches of agricultural science and in getting into touch with research workers in other countries. The Conference felt that these common difficulties should be met by a common effort.

2. It accordingly recommended that eight bureaux be established to collect, collate and disseminate information on research in selected branches of agricultural science, and generally to assist research workers in the Empire with information on their subject and with introductions to other research workers. Each bureau was to deal with one of the following branches of agricultural science and be located at an Institute already well known for research in its branch.

Soil Science	Plant Genetics (other than Herbage)
Animal Health	Plant Genetics (Herbage)
Animal Nutrition	Fruit Production
Animal Genetics	Agricultural Parasitology

The cost was to be met from a common fund formed by contributions from Empire Governments.

3. These proposals were accepted and a scheme for the finance and administration of the bureaux was prepared at a representative meeting held in London in November, 1928. The acceptance by governments of this scheme brought into being a new type of Imperial organisation. Since 1st April, 1929, a service of common Empire interest has been maintained from a fund jointly subscribed by the Governments of the Empire and administered by an Executive Council composed of representatives directly appointed by the governments for that purpose.

4. By locating the bureaux at selected research institutes the officers are in daily touch with men engaged in research in their own subject and profit by the guidance and assistance of the Heads of those Institutes. The organisation controlling each of the selected Institutes has allowed the Head of that Institute to act as Director of the Bureau. Each bureau thereby receives the help which only men of wide experience and scientific distinction can give. Other officers of the bureaux are whole-time servants of the Council.

5. In addition, each bureau has in each country of the Empire an official correspondent, who is " the general friend " of that bureau in that country. These official correspondents are appointed by the different governments of the Empire for their interest in the particular branch of science with which a bureau deals.

6. On the adoption by governments of the recommendations made by the Imperial Committee on Economic Consultation and Co-operation, the Executive Council was made responsible for the supervision of the administration and finance of the Imperial Institute of Entomology and of the Imperial Mycological Institute with effect from 1st October, 1933.

REPORT

At its meeting on 29th July, 1936, the Executive Council of the Imperial Agricultural Bureaux adopted the following report relating to its seventh year's work—1st April, 1935, to 31st March, 1936. As in the two previous years the report deals separately with—

The Bureaux.
The Institutes of Entomology and Mycology.
The Research Schemes.

2. During the year the Council received with great regret the resignation of Mr. G. W. Klerck, the representative on Council of the Union of South Africa, and welcomed Mr. F. J. du Toit, who had been nominated in his place, and who was already known to many members of the Council.

The resignation of Dr. E. J. Butler, C.M.G., C.I.E., F.R.S., from the office of Director of the Imperial Mycological Institute was a severe loss. He was the first Director and under his guidance extending over 16 years the Institute gained a position among mycologists unchallenged and unchallengable. He resigned to undertake the Secretaryship of the Agricultural Research Council in Great Britain. Mr. S. F. Ashby—the Senior Mycologist—who had been one of Dr. Butler's first colleagues in the Institute, was appointed Director in his place.

3. One of the chief events in the year was the holding of the Fourth Imperial Entomological Conference in September, 1935. This conference, like the Imperial Mycological Conference, meets at five-yearly intervals. It has been fortunate that it has so happened that since the Council became responsible in the autumn of 1933 for the supervision of the administration and finances of the two Institutes, each of these quinquennial conferences has fallen due—the Mycological in 1934 and the Entomological in 1935. The Council has thus early in its charge, had the opportunity of meeting the mycologists and entomologists of the Empire and of ascertaining their considered opinions on the work and future activities of the respective Institutes.

I. THE BRITISH COMMONWEALTH SCIENTIFIC CONFERENCE, 1936.

4. A British Commonwealth Scientific Conference will assemble in London in September, 1936. At that Conference the finances and work of the institutes and of the bureaux will be examined. That Conference will also bring under review subjects which have been dealt with in reports to governments by Council relating to research projects and will consider the resolutions passed

at the Conferences of mycologists and entomologists in 1934 and 1935 respectively.

5. In view of this Conference the Council has decided to make this annual report somewhat fuller than usual. Seven years have elapsed since under the orders of the governments of the Empire the Council—itself the first Inter-Imperial agency to be formed in accordance with the principles laid down in the 1926 Imperial Conference resolution on Dominion status—started to organise eight bureaux for systematically collecting and abstracting information on research in eight branches of agricultural science and for distributing that information to research workers in Empire countries. Three years have elapsed since the governments of the Empire ordered the transfer to Council of the supervision of the administration and finance of the two older Institutes of Entomology and Mycology which in addition to serving as centres for the collection and distribution of information in their sciences also assist research workers in the Empire in the identification of insects and fungi. At the same time under the orders of governments the Council became responsible for certain research schemes and for the supervision and finance of the Journal of Dairy Research.

6. Thus under one organisation common to the whole Empire, supported by the whole Empire, and directly and solely controlled by the representatives of the contributing governments, an information service has been placed at the disposal of agricultural research workers in all parts of the Empire in a group of sciences covering not all, but—certainly if the work on dairying be added—most of the important branches of science which interest the agricultural investigator: viz., entomology, mycology, soil science, animal health, animal nutrition, animal genetics, plant genetics, herbage, fruit production, agricultural parasitology, and to a more limited degree, dairying.

7. The abstract journals and periodicals dealing with these branches of science, and issued under the general administration of the Council are as follows. The letters M., Q., A. indicate whether the publication appears monthly, quarterly or annually. The price against each journal is the rate of annual subscription in June, 1936.

i. *Abstract Journals.*

Review of Applied Entomology—Series A. (deals with insects injurious to plants)	M.	30/–
Review of Applied Entomology—Series B. (deals with insects harmful to man and animals)	M.	15/–
Review of Applied Mycology	M.	21/–
The Veterinary Bulletin	M.	40/–
Nutrition Abstracts and Reviews	Q.	42/–
Plant Breeding Abstracts	Q.	15/–
Herbage Abstracts	Q.	15/–
Horticultural Abstracts	Q.	15/–
Animal Breeding Abstracts	Q.	15/–
Helminthological Abstracts—Five or six times a year		30/–

ii. *Bibliographies.*

List of publications relating to Soils and Fertilizers. (mimeographed) ..	M.	10/-
Index Veterinarius	Q.	£5
Bibliography of Helminthology (from 1934 incorporated in Helminthological Abstracts)		

iii. *Journals containing original papers.*

Bulletin of Entomological Research	Q.	30/-
The Journal of Dairy Research—three times a year		25/-

iv. *Lists.*

Zoological Record (Insecta)	A.	15/6
List of Agricultural Research Workers in the British Empire	A.	2/6

The regular issue of these journals and periodicals forms a considerable part of the work of the institutes and bureaux. But as will appear from the subsequent paragraphs in this report several other information services have been developed, e.g., the supply of reprints, translations, technical communications or reviews on particular subjects, etc.

8. Information services take time to establish and perhaps more time for their range of usefulness to be understood. The established abstracting journals and bibliographies go to some 4,820 research institutes and research workers in Empire countries. Even so it is doubtful whether these journals do in fact reach all those who could and should make use of them or whether those workers realise the help which in other directions these institutes and bureaux can give to them.

Many scientists have said that for full use to be made of an abstracting service it is not sufficient for the journal to be available in the research institute's library, it should be beside the worker on his laboratory bench, within reach of the lecturer revising his notes, in the possession of the young graduate starting on his life's work in science.

9. Effective service—and the main purpose of the institutes and bureaux is not research but to serve scientists engaged in research and its application to the agricultural problems of their countries—depends very largely on personal contacts and mutual understanding between those providing and those using the service. The Council attaches great importance to the promotion of such contacts and such understanding.

10. These questions of more efficient circulation of information, improved liaison and further useful services within the limits necessarily set by financial and administrative considerations will also come under examination at the Conference.

II. THE BUREAUX.

A. Administration and Finance.

11. The only changes in the Senior staff at the bureaux were the appointment of Mr. J. L. Fyfe, B.Sc., as Assistant at the Imperial Bureau of Plant Genetics, Cambridge and the resignation of Dr. J. N. Oldham due to his

appointment to a lectureship in Helminthology at the Royal Veterinary College. Dr. Oldham had been associated with Dr. B. G. Peters at the Imperial Bureau of Agricultural Parasitology, St. Albans.

12. Accounts.—The audited statement is attached. On the receipts side two items call for comment.

(i) Normal annual contributions from governments amount to £21,670. Towards this for 1935–36 a sum of £957 2*s.* 6*d.* was received before the 1st April, 1935 (*see* previous year's report) and £20,992 7*s.* 6*d.* was received during the year. The position as regards contributions in 1935–36 was therefore as follows :—

	£	s.	d.
Received in advance before 1st April, 1935	957	2	6
Received during 1935–36	20,992	7	6
Total	21,949	10	0
Deduct total normal contributions for 1935–36	21,670	0	0
Balance being advance payments towards 1936–37 ..	£279	10	0

(ii) The item—£162 10*s.* 11*d.*—shown in the accounts as " excess of contributions for 1935–36 retained "—represents advance payments received in 1935–36, but accruing to the Institutes in 1936–37.

All contributions from governments for 1935–36 were received in full for the bureaux, and for the research schemes, *viz.*, Farnham House Laboratory, Slough, Low Temperature Research and Wool Research at Torridon. Two contributions to the last of these were received after the close of the financial year.

13. *Expenditure.*—Net expenditure, i.e., after deductions of receipts from sales of publications was £23,628 15*s.* 6*d.* as compared with £21,918 19*s.* 6*d.* in 1934–35.

	1934–35			1935–36		
	£	s.	d.	£	s.	d.
Net expenditure at the eight bureaux ..	19,599	10	5	20,103	0	6
Net expenditure at headquarters	2,319	9	1	3,237	14	9
Journal of Dairy Research	—			288	0	3
	£21,918	19	6	£23,628	15	6

(*a*) The increase in expenditure at the bureaux arising from
(i) increased printing charges:
(ii) operation of increments in salaries:
(iii) restoration with effect from 1st July, 1935, of the balance of the " economy " reductions in salaries

was largely met from increase in receipts from sales of publications (£704, *see* para. 15 below).

(*b*) The increase of £918 5*s*. 8*d*. in expenditure at Headquarters was due :—

(i) to the adjustment in the accounts of 1935–36 of a sum of £443 15*s*. 1*d*., due to the Imperial Economic Committee for part cost of shared staff attributable to the year 1934–35, but not adjusted until after 1st April, 1935 (*see* para. 5 of the Council's Annual Report for 1934–35); and

(ii) to increased cost for clerical establishment and accounts arising from increased work at Headquarters, to the restoration of the balance of "economy" cuts and the introduction of a contributory insurance scheme for the staff shared with the Imperial Economic Committee.

Making the adjustment of £443 15*s*. 1*d*. referred to in (*b*) (i) above the net cost at Headquarters in 1934–35 and 1935–36 was £2,191 16*s*. 0*d*. and £2,793 19*s*. 8*d*. respectively.

(*c*) Journal of Dairy Research : The Council had undertaken to make good with effect from 1st April, 1934, any deficiency required by this journal up to £250 a year. Owing to the submission of the last printing bills for the year 1934–35 after 1st April, 1935, the first year's accounts closed with a credit entry of £65 7*s*. 0*d*., and payments in the second year's accounts (those of 1935–36) were increased accordingly.

14. The net expenditure in 1934–35 and 1935–36 was, as shown in the beginning of the previous paragraph, £21,918 19*s*. 6*d*. and £23,628 15*s*. 6*d*. This compares with normal annual contributions of £21,670. The excess in each year has been met from the interest on the reserve funds and from drawings on those funds. This is in accordance with the recommendation of the Imperial Committee on Economic Consultation and Co-operation which, while recommending an addition of £1,800 a year for Headquarters, reported as follows in regard to the finances of the bureaux :—

* "It is now anticipated that no increased provision will be necessary in the second five-year period (i.e., from 1st April, 1934, to 31st March, 1939), growth in expenditure during that period being met from the reserve fund."

15. *Receipts from Sales*.—These relate to the last seven periodicals set out in para. 7 (i) above, those in 7 (ii), and to the List of Agricultural Research Workers of the British Empire, and include sales of other miscellaneous publications of those bureaux concerned.

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* This recommendation was accepted by all governments concerned.

Receipts from Sales of Publications.
(other than Nutrition Abstracts and Reviews)

	1930–31	1931–32	1932–33	1933–34	1934–35	1935–36
	£	£	£	£	£	£
Soil Science	6	51	57	73	103	404
Animal Health	116	756	735	1,161	1,328	1,287
Animal Nutrition	—	19	54	22	16	20
Animal Genetics	—	7	12	79	151	160
Fruit Production	3	55	61	115	126	160
Plant Genetics (Herbage)	—	38	54	83	136	208
Plant Genetics (non Herbage) ..	1	46	77	123	128	131
Agricultural Parasitology	—	13	15	18	22	353
Headquarters	—	4	15	5	13	4
	126	989	1,080	1,679	2,023	2,727

The receipts from the Sales of Nutrition Abstracts and Reviews are not included in the above table. The arrangements whereby the Medical Research Council and the Trustees of the Reid Library, Aberdeen, also contribute to the production of this journal, necessitating the maintenance of a separate account to which receipts from sales are also credited, have been explained in earlier reports. Receipts from sales of this journal in 1935–36 amounted to £1,167 16*s.* 6*d.* This compares with receipts in previous years as follows :—

1930–31	1931–32	1932–33	1933–34	1934–35	1935–36
£	£	£	£	£	£
—	632	840	841	973	1,168

Adding these figures to those in the above table the total receipts from sale of publications were :—

1930–31	1931–32	1932–33	1933–34	1934–35	1935–36
£	£	£	£	£	£
126	1,621	1,920	2,520	2,996	3,895

The largest increases in the year were under Soil Science and Agricultural Parasitology. The increase under Soil Science is due to a larger demand in the year for several of its publications, and especially for the Bibliography of Soil Science, Fertilizers and General Agronomy which was published in the year. The increased receipts under Agricultural Parasitology were swollen as to £150 by refunds on settlement of accounts with the Journal of Helminthology. As explained in the third annual report of Council, arrangements were then made whereby the abstracts of Agricultural Parasitology appeared in the Quarterly Journal of Helminthology, the journal receiving a payment towards printing, and the bureau receiving reprints for its own purposes. The number of abstracts has increased, and during the year 1935–36 arrangements were made whereby they are published in a separate abstracting journal

issued by the bureau, and similar to those coming from the other bureaux. With this change the Bibliography of Helminthology has been incorporated with Helminthological Abstracts. This is both an economy and a convenience.

16. Receipts from sales now form a substantial part of the income of the bureaux. Further, their steady increase is evidence that the publications issued by the bureaux are both meeting a real need, and gaining increasing recognition.

B. *The Year's Work*

17. A report for each bureau prepared by its Director or Deputy Director, is printed in the Appendices Nos. III to X. These reports deal primarily with the work of the year, but also cover in a general form developments which have taken place in the work and activities of each bureau.

18. In the early years of an abstracting service a rapid expansion in the numbers of articles noted and abstracted is to be expected as a result of the organisation becoming better known and improving its relations with the sources of information. The number of entries in the seven abstract journals issued from the bureaux was of the order of 15,000 in the year 1935–36, as compared with 8,500 in the year 1932–33. In the same four years the Index Veterinarius containing annually some 10,000 entries had been started, and the entries in the list of publications relating to soils and fertilizers had increased from 2,000 to 3,000.

19. The mailing lists for these publications include the names of 3,818 recipients. The revenue from sales of the periodical publications is included in the figures given in paragraph 15, but the figures therein given also include receipts from the sales of occasional publications. Many of the copies of the periodicals are distributed free among research institutes and research workers in the British Empire. The total distribution is analysed as follows :—

	Numbers of copies.			
	Free.	In exchange or to contributors.	To Subscribers.	Total
Contributing countries	1,302	127	1,094	2,523
Foreign countries	10	326	950	1,286
	1,312	453	2,044	3,809

20. Apart from the increase in the number of abstracts included in the journals and the increase in their distribution, the only changes in the year were :—

(i) The Bibliography of Helminthology has been incorporated with Helminthological Abstracts, which is now issued as an abstract

journal independent of the Journal of Helminthology. (Compare para. 14 of Third Annual Report, 1931–32).

(ii) As Index Veterinarius was clearly meeting a particular demand, but as objection had been taken to it on account of its bulk (it was issued mimeographed), the Council authorized its printing, but decided to raise the subscription rate from £4 to £5 a year to meet some of the additional cost.

21. In addition to the journals, the bureaux issue Technical Communications or Occasional Papers. Those still available at the various bureaux are included in the list of publications at the end of this report. These Technical Communications are reviews of the literature (with bibliographies attached) on special subjects. Occasionally a subject is suggested by a correspondent, but for the most part the selection is made by the bureaux officers as being of wide interest, or as being one on which many enquiries have been received or as being a comparatively new development to which it seems desirable to draw general attention (for examples see the bureaux reports in Appendices III to X). Not infrequently the material collected for replying to a special enquiry forms the basis later for a Technical Communication.

In a desire to maintain a high degree of accuracy and usefulness in these communications the aid of specialists, not on the staff of the bureaux, is often sought either for writing the review or for examining and criticising the proofs.

22. The demand for some of these publications exceeded anticipations. The one on Tea Soils issued from Rothamsted was sold out in three months. Those on the Technique of Artificial Insemination (Edinburgh) and on A.I.V. Silage (Aberdeen) have had to be reprinted. The one on Vernalization issued jointly in 1933 by the bureaux at Aberystwyth and Cambridge was sold out and the demand remained unsatisfied: in the meantime much additional work had been done on this subject in many countries and the two bureaux therefore collaborated in 1935 in the preparation of a very much fuller review, entitled—Vernalization and the Phasic Development of Plants.

23. The reports printed in the Appendices (III to X) show that the bureaux have in hand a large number of reviews and bibliographies on matters of wide interest:—for example, Nutrition in relation to Disease, both human and animal (Aberdeen), The production of seed of herbage and forage plants (Aberystwyth). A summary of the position regarding the Woolly Aphis (East Malling), while at Weybridge, in response to a request from the Agricultural Research Council of the United Kingdom, the material has been collected for reviews of literature on a range of important diseases including contagious abortion, swine fever, anaerobic infections, and Johne's disease.

The number of publications of this type which a bureau can issue in any year is chiefly determined by the time available after maintaining the day-to-day services—such as the scrutiny and indexing of incoming literature, the

preparation and regular issue of the abstract journals and the answers to correspondence.

24. An abstract journal almost inevitably must be to some extent selective. In certain instances—Nutrition Abstracts and Reviews (Aberdeen), and the Helminthological Abstracts (St. Albans)—that criticism is avoided by including in the journal all titles indexed at the Bureau, many of them, of course, appearing in the journals only as titles. In this way these journals in themselves meet the demand from the libraries of research institutes for full bibliographies of current publications and articles. A similar course is not possible in other cases—obviously not in Veterinary Science. Hence the bureau of Animal Health (Weybridge) issues also Index Veterinarius.

A notable addition to this bibliographical service was made by the Soil Science bureau during the year. That bureau for several years has met and continues to meet this demand for bibliographies of current information by the monthly issue in mimeographed form of the titles of the articles indexed in the bureau. In 1935 the bureau went through all the monthly lists it had issued between 1931–1934, rechecked them and classified them as a whole, publishing the result in a handy volume entitled " Bibliography of Soil Science, Fertilizers and General Agronomy, 1931–1934." For the period covered (1931–1934) it is the most complete and compact index on Soil Science literature available and as such has been well received.

Complaints have been received that in these general indexes issued by the bureaux the literature in the years prior to the establishment of the bureaux is ignored; such criticisms do not apply, of course, to the bibliographies attached to the Technical Communications which deal with special subjects, but only to the general indexes. With the staff available, and with the mass of current information to be scrutinised and arranged, the preparation of general comprehensive indexes for pre-bureaux years is impossible; but such communications indicate the increasing usefulness of these general indexes and of the abstracting journals.

25. Other services rendered by the bureaux are recorded in the Appendices to this report. Some of these have been developed by the bureaux as being in the direct line of their work; others have come to them rather as offshoots of the services which they have rendered. In the first category may be mentioned the monthly letter from the Soil Science bureau which draws immediate attention to and discusses recent important publications and work; the collection of reprints and their loan on request which has been developed by several bureaux; (this is a service which research workers throughout the Empire are finding increasingly useful but the existence of which is even now not fully realized); the translation of special papers carried out by several of the bureaux, *see* the Plant Genetia (non Herbage) report; the regular supply to any research worker, in return for a very small payment, of a bureau's card index as it is formed of any particular branch of soil science in which

that worker is particularly interested. In the second category a most important and growing group centres round material. Both the plant breeding bureaux cite in their reports many requests from research workers either for collections of seeds or of plant materials, or for seeds of particular varieties or strains. It almost seems as if it were becoming a habit for some of the smaller countries to send samples of local foodstuffs to the bureau of Animal Nutrition at Aberdeen with a request to arrange for their analysis. In a similar way soil samples arrive at Rothamsted and pathological material at the bureau of Agricultural Parasitology, St. Albans. In most instances the bureau is able to obtain and despatch the material required or to arrange for the investigation to be done at some research Institute in the United Kingdom, usually that to which the bureau is attached.

26. *Conferences.*—No conference directly associated with a bureau was organized in the year, but the Third International Congress of Soil Science, of which Sir John Russell was Chairman, met in the United Kingdom in the Summer of 1935. Mr. G. V. Jacks, the Deputy Director of the bureau was responsible for much of the work of organization. The Congress was attended by over 400 delegates representing some 50 countries. Some 70 or 80 of delegates from about 20 countries came from portions of the Empire overseas. The Congress though not a bureau conference afforded a most valuable opportunity for explaining the bureau work and for renewing many old and for making new contacts. In addition the customary meeting of such soil scientists from overseas as happened to be in the United Kingdom in May, was held at Rothamsted on the day preceding the Institute's day.

Dr. Hudson and Dr. Whyte attended the Sixth International Botanical Congress at Amsterdam, in September, 1935. Vernalization was among the other questions discussed and the assistance given by the bureaux of Aberystwyth and Cambridge in making this work known was warmly acknowledged.

The Third International Grassland Conference is to be held in the United Kingdom in 1937 and Professor R. G. Stapledon, Director of the Welsh Plant Breeding Station and of the Plant Genetics (Herbage) Bureau, is the Chairman. The officers of the bureau at Aberystwyth are assisting Professor Stapledon in this matter, just as those at Rothamsted assisted Sir John Russell with the Soil Science Congress in 1935.

27. *Tours.*—The Council has always been conscious of the advantages to bureaux work of tours by its officers in Empire countries overseas. Understanding of the problems particularly interesting the country visited, of the services which a bureau can give and of the extent to which the information issued by the bureau is reaching those interested, is increased. In a word, tours are one of the means for ensuring that the bureau work keeps truly alive and in close touch with developments and changes. Tours are not, however, easy to arrange, whether because of their cost or of the long absences some of

them must entail. None of the permanent staff of the bureaux visited an Empire country overseas during the year. The Council, however, took the opportunity of the visit of Mr. Hatton—the Director of the Fruit Research Institute at East Malling and of the Imperial Bureau of Fruit Production situated there—to South Africa to commission him to explain and demonstrate the bureaux work whilst he was in that country.

28. At some of the bureaux the question of accommodation to meet the needs of expanding work has become or will shortly become urgent. As a result of its seven years' experience the Council is fully satisfied of the correctness of the decision to locate the bureaux at active research Institutes. The bureaux have derived very great advantages—so the Council is informed have the Institutes—from that association and from the interest taken in them by the Directors and staff at those Institutes. The Council desires once again to acknowledge its obligation and the obligation of all the bureaux staff, to the Directors of these Institutes for their advice, interest and help.

III.—A. THE IMPERIAL INSTITUTE OF ENTOMOLOGY. B. THE IMPERIAL MYCOLOGICAL INSTITUTE.

29. The audited statements are attached. Attention was drawn in the reports of the two previous years to paragraph 348 of the Report of the Imperial Committee on Economic Consultation and Co-operation, which recorded the fact that some governments had felt constrained to reduce or temporarily to withdraw their contributions to these Institutes and expressed the hope that " these governments will feel able to restore their contributions to their former basis."

It was reported in the annual report for 1934–35 that some governments had in that year seen their way to restore or increase those grants which had thus been temporarily reduced. Those restorations amounted to £440 in the case of Entomology and £102 10*s*. in the case of Mycology. Further progress was made in 1935–36, an additional £1,060 being restored in the case of Entomology and an additional £1,030 2*s*. 6*d*. in the case of Mycology.

But for these last restorations both Institutes would have had deficits on the year's working. Meanwhile the additional staff recommended in each case at the two Entomological Conferences of 1930 and 1935 and at the two Mycological Conferences of 1929 and 1934, had not been engaged and other highly desirable expenditure has been postponed.

30. Even with these restorations, reductions in the contributions of some governments to Entomology still total £1,000 less than they were ten years previously in 1925–26; and in the case of Mycology there was still a shortage of £132 7*s*. 6*d*. There is reason to believe that the shortages in both cases will be made good in 1936–37.

A. *Imperial Institute of Entomology.*

31. The audited statement of accounts is attached. Contributions received during the year, amounting to £12,517 7*s.* 10*d.* were made up as follows :

	£	s.	d.
Arrears for the previous year, including £100 from Egypt	450	0	0
Contributions for the current year from			
(*a*) Empire countries and the Anglo Egyptian Sudan	11,842	0	0
(*b*) Iraq	75	7	10
(*c*) The Royal Zoological Society and Imperial Chemical Industries Limited	150	0	0
	£12,517	7	10

32. The chief event of the year was the Fourth Imperial Entomological Conference in September, 1935, which was attended by the representatives of twenty different countries. The report of that Conference has been published and circulated and reference to it is requested. The general working and finances of both the Institute and of the Parasite Laboratory at Farnham House were examined in detail, and discussions took place among other subjects on the principles and methods of biological control of insect pests, on research into methods of controlling insects attacking stored produce, and on the damage done by termites.

As regards the Institute the Conference resolved

> " that the service for information and identification provided by the Institute is essential for the efficient discharge of the duties of entomologists throughout the Empire. Moreover the maintenance of such a service on a co-operative basis is economical and convenient."

The Conference viewed with concern the position in regard to identification. Correct identification is essential for all entomological work. It is a task for experts. The Conference appreciated the work which the Institute had done and was doing and also the outside expert help which the Institute had been able to secure, but the work was essential to entomologists and was falling into arrears. Closely allied with this question of identification was the need, pointed out by the Conference for ensuring more prompt publication of identifications when they are made. It would appear that the present publications specializing in such systematic information are unable to keep abreast of the data becoming available.

33. The Conference strongly recommended the strengthening of the staff of the Institute by two specialists in identification, and one additional abstractor for work on the journals, pointing out that the acceptance of those proposals would only restore the strength of the abstracting staff to what it had been six years previously (though in the meantime entomological literature has increased) and would bring the identification staff to the strength recommended by the Third Imperial Entomological Conference in 1930.

34. In this connection the figures of the work on identification and abstracts noted in the Journal are apposite—see the Director's report, Appendix I.

Identifications	1932–33	1933–34	1934–35	1935–36
Collections received for identification ..	520	417	482	552
Number of correspondents sending collections for identification	219	181	220	207
Specimens contained in the collections ..	113,300	106,700	80,733	101,728
Lists of identifications issued	369	386	343	359
Containing specific names numbering ..	9,602	8,287	9,411	7,270

Publications	1933	1934	1935
Review of Applied Entomology :—			
Number of Abstracts or Titles therein	2,606	2,772	2,901
Bulletin of Entomological Research—No. of pages..	599	624	617
Zoological Record—Part Insecta (Titles)	3,238	3,235	3,405

Of the insects identified, 40,500 were handed over to the British Museum of which 414 were new to science and 614 were named specimens not previously in the National Collection.

35. For 1935 the rates of subscription to the Review of Applied Entomology were raised—that to Series A from 30*s*. to 42*s*., and that to Series B from 15*s*. to 21*s*., without reducing the number of subscribers. In fact in the year the number of subscribers in each case increased by 6.

36. Identification and the collection and dissemination of information form the chief day to day work of the Institute. The Director—see Appendix I—has in his report for this year given examples of the nature of some of the enquiries which have reached the Institute during the year. They have come from most widely scattered parts of the Empire and deal with all sorts of questions relating to insect attack or the risk thereof. One interesting feature, in view of the work in progress at Farnham House Laboratory, is the number of enquiries touching on the question of biological control of insect pests, a confirmation of the impression given in the discussions at the Fourth Imperial Entomological Conference in September, 1935 that increasing attention is being given in many countries to the possibilities of using methods of biological control, to the conditions which must be observed for successful results and to the need of detailed knowledge for their successful use.

37. The Director's report also contains a list of scientific papers published in the year by members of the Staff of the Institute. At the request of the Zoological Society of London Dr. Neave has also started on the production of a new "Nomenclator Zoologicus."

The Director and Dr. Neave attended the International Entomological Congress at Madrid in the beginning of September, 1935.

38. During the last six years the demands on the Institute have continued to grow but the reduction in its resources, due to reductions in contributions, had severely hampered its efforts to meet those demands. In the year the

entomologists of the Empire, assembled in conference, have endorsed the work of the Institute and repeated their request for strengthening the staff to meet the increasing work. The prospect of restoration of contributions, which has indeed partially taken place, raises the hope that the Institute may shortly be put in a position to meet more fully the demands which are being made upon it.

B. *The Imperial Mycological Institute.*

39. As already stated the chief change during the year was the resignation of Dr. E. J. Butler, C.M.G., C.I.E., from the post of Director and the appointment in his place of Mr. S. F. Ashby.

In the consequential arrangements, Mr. H. A. Dade, who had been Mycologist in the Gold Coast Colony was appointed to the staff of the Institute.

40. The audited statements are attached. Contributions at £7,292 12*s.* 6*d.* exceeded those received in 1934–35 by £1,130 2*s.* 6*d.*, made up of the £1,030 2*s.* 6*d.* referred to in paragraph 25 and £100 from Egypt being £50 arrears for 1934–35 and £50 for the year under report, 1935–36. Receipts from sales of publications also increased slightly.

This improvement in total receipts saved the Institute for the first time for several years, from having to draw on its rapidly dwindling balances. But this financially favourable result was only obtained by the strictest economy in expenditure—expenditure which could be postponed was postponed, and the additional mycologist strongly recommended by the Mycological Conferences of 1929 and 1934 to cope with the increasing demands for identification of material has not yet been appointed.

41. The Director's Report is printed as Appendix II. The work proceeded on the same main lines as in previous years—investigation, identification and information. The Director's report shows how the investigational work is conducted in close co-operation with mycologists in overseas parts of the Empire, and how by means of it progress is being made in clearing up errors in classification and identification. The instances quoted in the section on identification show both the variety of material sent to the Institute for identification and the wide range of Empire countries from which such material comes. This gives point to the request made by the mycologists of the Empire at the last two Conferences, that the staff at the Institute on identification work be strengthened. Correct identification is at the root of all remedial measures. Very frequently such identification is a task for experts in the different genera and species. Mycologists in many parts of the Empire rightly look to the Institute for aid in such expert work. In that work the Institute to the great advantage of the mycologists in the Empire has enlisted the free assistance of many experts unconnected with its staff, but to cope with the demands which come in the staff at the Institute needs strengthening.

A secondary advantage from this work of identification is that it assists mycologists in the various Empire countries to compile the lists of the diseases of the economic plants of their territories. Within the year a supplementary

list for Tanganyika was published, lists for Sierra Leone and the Gold Coast were made ready for publication and the list for Cyprus was completed.

42. The Review of Applied Mycology holds its position as the leading abstract journal in that science. The number of subscribers has continued to increase, and the total distribution of 994 copies in 1935 was only 44 below the peak year of 1932—1,038—i.e., before the chief intensity of the depression and before the subscription was raised from 18*s.* to a guinea.

The Director gives the following comparative figures :—

	No. of abstracts and notices.	Price per Vol.	*Distribution.*			
			Free	Subscribers	Exchange	Total
Vol. IV. 1925	1,450	12/–	258	286	170	714
Vol. IX. 1930	1,634	18/–	260	480	174	914
Vol. XIV 1935	1,929	21/–	248	586	160	994

43. At the 1929 Mycological Conference discussions took place on the various legislative measures directed to check the introduction of plant diseases into a country. Practical advantages would follow from the adoption of a uniform form of " health certificates " to accompany plant exchanges and imports. A form was suggested. It was fully recognised that the acceptance of these health certificates does not imply that importing countries waive their rights to prohibit, inspect, treat, quarantine or destroy plant imports, whether certified or not, nor that the addition of such other requirements as may be deemed necessary in respect of specified plant imports is precluded. Much correspondence followed. The 1934 Mycological Conference was able " to record with considerable satisfaction the progress which had been made," and to recommend for general adoption a general health certificate in a form revised as a result of that correspondence. In the two years which have elapsed since that Conference the Institute has been informed that this form of certificate has been so widely adopted by Empire governments as to be practically universal.

It is earnestly hoped that the departments of governments issuing regulations concerning the import of plant material and the legislative measures for the control of plant diseases will send copies direct to the Institute as issued. Most do, but occasionally copies of some regulations fail to arrive, causing gaps in the Institute's record of information.

IV. THE RESEARCH SCHEMES

44. These comprise those schemes which previously to October, 1933, were financed in whole or part from the Empire Marketing Fund, and towards the cost of which contributions from Governments have since that date passed through the Council's accounts. They are :—

(*a*) The work at Farnham House on the biological control of insect pests.

(*b*) The work at Slough on the control of insect pests attacking stored products.
(*c*) Low Temperature Research.
(*d*) Wool Research at Torridon.

The Farnham House work is a development of the work of the Imperial Institute of Entomology, and is entirely under the control of Council. The work at Slough, though originally financed solely from the Empire Marketing Fund, is one of the activities of the Imperial College of Science and Technology. Low Temperature Research is directly controlled by the Department of Scientific and Industrial Research, and the payments through Council are of the nature of a grant in aid. The direction of the work is settled in discussion with the Food Investigation Board, of which the representatives of contributing governments are members. The Wool Research at Torridon is directly controlled by the Wool Industries Research Association, and representatives of contributing governments are members of the Wool Fibres Committee set up by the Association to keep in touch with the research work of particular interest to wool producing countries.

45. For 1935–36 contributions had been asked from Governments for each scheme at the same rates as in 1934–35 except that for Slough a uniform reduction of 20 per cent. had been proposed. All these contributions were received (*see* para. 8 above). In regard to 1936–37 the Council recommended to governments, pending the holding of the Scientific Conference, that the contributions to Farnham House should be continued at the same rate as hithertofore, that those to Slough (*see* para. 52 below) should cease, but that those governments which had not so far provided funds for the initial six months period—1st October, 1933, to 31st March, 1934—should be requested to do so. The governments which had hitherto contributed to Low Temperature Research were asked to continue at the same rates and similar requests to those made for Slough were put forward to clear the liability for that initial period. The contributions to Wool Research were under active discussion at the close of 1935–36 among the representatives of the governments chiefly interested in wool production.

All these research schemes will be considered and discussed at the British Commonwealth Scientific Conference to be held in London in September, 1936.

Farnham House Laboratory

46. A copy of the Director's report is attached—Appendix XI. That report is especially interesting because, whilst giving an account of the work done at the Laboratory, the Director has also described in non-technical language the habits of the various pests for which the Laboratory has been asked to obtain parasites, the reasons why biological control in those cases was the most promising, often the only one possible, the advisability in many instances of making field collections of the desired parasite rather than attempting rearing in a laboratory, and has incidentally brought out the highly specialised nature of this work. The separation and identification

of parasitic insects is notoriously difficult, and though the help of a few competent specialists is available, Dr. Thompson points out that the field worker engaged on this work must himself have a " very fair working knowledge of the parasitic groups, if he is to detect and appreciate the slight and delicate differences by which species are distinguished." Where the object of such field work is the despatch of suitable parasites to a distant country—as is much of the actual work at Farnham House—collections must often be made while the parasites " are in an early stage of development, so that they do not reach the adult stage and die during the course of their long journey." Ability to distinguish them in this early stage of their development demands a very detailed knowledge of them at that stage.

47. This need for basing the application of biological control on detailed knowledge and research was the theme of the discussion at the Fourth Imperial Entomological Conference (*see* pp. 61 to 65 in the report of that conference). In one form or another speaker after speaker reverted to it. The value of the immediate work at Farnham House—which, incidentally, is the more spectacular and, therefore, has the greater popular appeal—was freely and generously recognized, but it was this desire for greater and more precise knowledge on the whole question of beneficial parasites, their identification, their life histories, their occurrence, the technique for their transport, their handling on receipt and the results following their release—that was behind the proposals that Farnham House should publish the " Parasite Catalogue," which it has compiled, and to which it is continually adding, and which should develop facilities for training and research. In making these proposals it was recognised that the circumstances attending the establishment of the Laboratory, and especially those of the last few years, had inevitably directed the attention of the staff to the supply of urgently required parasites for particular pests.

48. The Laboratory has been organized mainly for the collection and despatch of parasites required by entomologists in their efforts to combat the ravages of insect pests, but such efforts to extend knowledge and conduct research as were possible within such an organization have been made. The " Parasite Catalogue " has been fully maintained and added to. With its cross references to the parasites of injurious insects and to the pests it is, as far as is known, the most complete catalogue of its kind and is invaluable in enabling information to be supplied at short notice. The question of its publication is under consideration. In actual research the officers write up and publish results which are obtained in the course of their work, but efforts have been made to go beyond that by giving facilities to selected voluntary workers or to research workers of other organizations—e.g., Mr. G. C. Ulyett by the Agricultural Research Council of Great Britain, to work at the Laboratory under the general supervision of the Director, though such temporary arrangements are, of course, always liable to sudden interruption.

Five scientific papers dealing with various aspects of the work were published during the year.

49. The main work of the year, as in the two preceding years, was, however, the collection and shipment of parasites required by the entomologists, chiefly to Canada. Shipments were made to five Empire countries. The number of specimens despatched in the year, viz., 3,133,625 was about three-fifths the number in the previous year, 5,298,274, but even so was nearly three times the number despatched either in the year 1933/34 or in all the six years 1927/28 to 1932/33. The fall in numbers shipped is due to unfavourable weather conditions in the chief areas of collection causing a relative scarcity of the desired parasites. Conditions in 1934/35 were very good. For the parasites of the White Spruce Sawfly (a Diprion) urgently required by Canada collections were made as in the previous years in the countries of Central Europe and also in 1935/36 in Scandinavia. The Director reports that he has heard from Canada that six or seven of the species which have been sent in the last few years have been recovered in the areas where they have been introduced. Since the close of the year Dr. Thompson has visited Canada to see the progress of the work and to discuss questions with the Canadian entomologists.

The numbers of specimens despatched to other countries of the Empire in each case exceeded the numbers despatched in the previous year.

50. The audited statements are attached. Net expenditure at £5,237 9*s.* 11*d.* compares with net expenditure in the previous year of £5,046 19*s.* 5*d.*, and contributions, which remained at the original figure of £5,035. The increase in expenditure was due to increments and restoration of the balances of the economy cuts. The various charges for accommodation, sales of parasite material and specific work undertaken yielded in all £882 12*s.* 7*d.* available to meet overhead expenses as compared with £852 18*s.* in the previous year. Of the amount of £882 12*s.* 7*d.* a sum of £263 11*s.* 5*d.* was outstanding at the end of the year and has since been paid. The Council hopes to be able during 1936/37 to liquidate the debt on the Laboratory for the period 1st October, 1933 to 31st March, 1934, without asking for contributions from governments for that period (*see* para. 34, the report for 1934/35).

Stored Products Research Laboratory, Slough.

51. The financial year of this Laboratory runs from August 1st to July 31st. The audited statement published in the Council's report for 1934–35 covered the period up to 31st July, 1935. No audited statement is attached to this report as the financial year of the Laboratory has not yet closed. The Director's report published in the Council's report for 1934–35 covered the period to the 30th September, 1935.

52. The work done at Slough continues steadily to gain increasing recognition both scientifically and practically. The Council has learnt that the scientific research in progress has, in the course of the last two years, received favourable report from eminent scientists who have inspected it in detail. As regards commercial application, one example will suffice. The Australian Dried Fruits Board had had repeated and constant difficulty over

insect infestation in their warehouses. In the end they went to the Slough Laboratory for aid and advice. Much of the practical application of the Slough methods was worked out in conjunction with that Board. The result can be given in a sentence :—" The Australian Dried Fruits Board have for the last two seasons sold their fruit without a single complaint of infestation and the Laboratory find their warehouses so clean that they have abandoned them entirely as a source of insects for experimental work."

53. The scientific papers issued by the Laboratory on their investigations and research are necessarily severely technical and limited to the particular problem under report. Recently Professor Munro has in two papers* stated in more general terms the problems involved in successful control by fumigation of insect pests in closed spaces and the objectives towards which further research has to be directed.

The general trouble is that, although fumigation is one of the most widely used methods for dealing with insect infestations in closed spaces, it is still too largely used empirically. Uniform distribution of the fumigant inside a building or closed space is too readily assumed to occur as a matter of course. Insufficient attention has frequently been given to the absorption and adsorption of the fumigant by the building and packages which, if considerable, reduces the quantity of gas available to destroy insects and increases the residual fumigant to be dispersed after fumigation ceases. The distribution of the fumigant within the closed place or warehouse has not only to be even but rapid.

In addition the principles governing the toxicity of insects to fumigants are by no means as yet fully understood. Apart from the variation of toxic action according to the species and stage of development of the insect, recent work at different centres points to toxicity varying directly with the rate of metabolism in the insect. Published results show that if insects of the same species and at the same stage of development are fumigated at different temperatures those fumigated at the higher temperature succumb more rapidly. If the two sets have been kept at different temperatures and are then fumigated at the same temperature then those which have been kept at the higher temperature succumb more rapidly. If one batch has been starved prior to fumigation and the other fed, then the well fed succumb before the hungry. These apparently unrelated results when linked with other fundamental research work on insect physiology point to the conclusion that toxicity varied directly with the rate of metabolism.

Professor Munro sums up the position as follows :—

> " Two main lines of work are necessary : basic or longer range research in insect physiology and especially in insect respiration, and basic research on the adsorption of gases by various foodstuffs, other

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* Insect damage to Empire Products. Paper read before the Royal Society of Arts, 26th May, 1936. Recent advances in fumigation and the needs of fumigation practice. No. L 3. Chemical Engineering Congress of the World Power Congress, 1936.

produce and by packing materials and *ad hoc* experimental work on methods for improving the dispersal and penetration of fumigants, for reducing the degree of their adsorption and absorption by goods and containers and for ensuring more rapid and complete removal of such residual fumigant as may still be formed."

54. The practical results obtainable are shown in the case cited at the end of paragraph 52. Very considerable success has also been obtained in dealing with infestation of tobacco in store in the United Kingdom. When it had been fully established that the treatment had no deleterious effect on the flavour of the tobacco the results with full details of the methods were communicated to overseas countries interested therein. As will be clear from what has been said above, the successful application of those methods in different conditions—as for instance to different forms of warehouses—will require careful attention to points, such as the rapid and even distribution of the gas, which have become prominent in devising the most suitable technique for London warehouses. In fact, Professor Munro surmises that for thoroughly successful results, trained staff is as important as correct method.

55. Both economically and from a public health point of view the control of insect infestations in closed spaces is of importance generally. The work developed at Slough should elucidate many of the problems connected with fumigation and should render the application of fumigation much more effective. When the Empire Marketing Fund ceased this work at Slough was threatened with immediate collapse, just when results were beginning to appear. The aid given by Empire governments and by the Trustees of the Carnegie Corporation of New York saved it, with the two-fold result that the scientific quality of the research work has had time to be more fully recognized and opportunity has occurred to demonstrate the practical efficiency of methods dependent on that research work. The Council believes that the time has come when the fundamental research at the Laboratory might well become one of the recognized activities of the Imperial College of Science and Technology and has accordingly recommended that governments discontinue their co-operative financial support through the Council. In the opinion of the Council it would follow as a corollary that in future full charges—sufficient to give some help to the necessary research work—should be made whenever the Laboratory is asked to aid in practical application. The Council would like to go further and commend this work to all who in the ordinary course of business store perishable commodities on any large scale or provide accommodation for such storage.

56. The Council has informed the Imperial College of Science and Technology of its conclusion and has recommended to governments that their contributions for 1936–37 should be restricted to the amounts necessary to enable the Council to discharge the money advanced by the United Kingdom Treasury for the six months 1st October, 1933 to 31st March, 1934—£900 11*s.* 9*d.* This was the sum provided temporarily in that period whilst

the question whether co-operative financial support should be given to this scheme was being determined. As such support was forthcoming it falls to be refunded under Section 351 of the Report of the Imperial Committee on Economic Consultation and Co-operation.

Low Temperature Research.

57. As already explained, this work is controlled by the Department of Scientific and Industrial Research, assisted by the Food Investigation Board, on which those governments which contribute to the work are represented. The report on the work done will be issued by that Board in due course. Throughout 1935–36, the "work of particular interest to the Dominions and Colonies has been prosecuted without diminution or curtailment."

58. The following brief summary has been supplied by the Department of Scientific and Industrial Research :—

"The work on the transport and storage of foodstuffs, carried out on the advice of the Food Investigation Board, continues to develop satisfactorily. General solutions have been found, in the gas-storage of fruit and chilled meat, and in the brine-freezing of fish, of the three main, practical problems that faced the Board on its establishment in 1917, and a large body of knowledge on the properties and behaviour of foodstuffs has been accumulated.

The separate problems encountered in the practical handling of the various foodstuffs can be stated scientifically in generalized form; for instance, the properties of animal proteins, fats and pigments, the respiration and carbohydrate matabolism of plant products, and the characterization of bacteria and moulds. The work has been organized on these lines, and the Board are satisfied that the organization is right. There are, however, additional lines of work that may now profitably be taken up, and six additional scientific officers are being appointed to enable this to be done. For instance, it is now known that the protein known as myosin controls the structural changes that take place in meat and fish during their storage, and an exact knowledge of the constituent amino-acids, and their disposition within the molecule is required; while in the case of plant products, the basis of attack is being broadened to include the study of enzymes, the metabolism of nitrogen, and the formation and breakdown of the cell wall. These new lines of work could not be contemplated, but for the progress that has been made in the past seventeen years.

Additional accommodation is also being provided. Two further laboratories have been added to the Low Temperature Research Station; the Covent Garden Laboratory is being removed to larger premises, and a small laboratory is to be established in the vicinity of Smithfield Market, generally on the lines of the Covent Garden Laboratory, as a centre for liaison with the trade. At the enlarged Govent Garden Laboratory facilities will be available for the use of officers of H.M. Governments overseas, and it is hoped to include in the laboratory's work studies on methods of assessing and fixing standards

of quality; on the various types of containers and packages in use, and on handling, both in the market and at the docks.

A new trade in chilled beef from Australia, New Zealand, South Africa and Southern Rhodesia has developed, and the co-operation between the research staffs in Australia, New Zealand and Great Britain, and the shipping lines merits special mention. Further advances, leading especially to an improvement in " bloom," may be expected as the result of investigations now being carried out at the Low Temperature Research Station, with the assistance of a member of the staff of the Council for Scientific and Industrial Research of Australia.

Two years' work has yielded a reasonably clear picture of the changes that take place in eggs during storage. Most of the changes in the white and yolk-membrane can be related to the known properties of the protein ovomucin. The effects of the period and temperature of storage and of the hydrogen-ion concentration of the egg on the strength of the yolk-membrane have also been investigated, in view of the importance of this factor in determining the quality of an egg. At the present time, storage trials on a large scale, and covering a wide range of conditions, are in progress, and special arrangements have been made for assessing the quality of the eggs for various purposes at the end of storage.

Further developments have taken place in the gas-storage of fruit. A scrubber has been designed for removing excess carbon dioxide where it is desired to maintain atmospheres containing low percentages of both oxygen and carbon dioxide. This scrubber has been successfully tested in the 30-ton gas-store at the Ditton Laboratory. English Conference pears have been shown to respond well to gas-storage, and first-rate flavour, texture and appearance can be obtained after long periods of storage; further, the fruit takes longer to ripen after removal from gas-storage, than cold-stored fruit, or even than freshly gathered fruit. This is an important gain in marketing.

Modifications in the stowage of fruit during transport overseas have been proposed as the result of work done in the experimental hold at the Ditton Laboratory. For holds cooled by brine-grids, the " tower " system of dunnage has been found satisfactory in commercial practice, while the modifications suggested for holds cooled by forced circulation of cold air are now under test. In the experimental hold itself the " jacket " system of cooling, proposed as a contribution towards the solution of the problem of providing a method of refrigeration equally suitable for a wide range of cargoes of foodstuffs, such as fruit, chilled and frozen meat, butter and eggs, has been investigated, and, with a cargo of apples, has given better results as regards uniformity in the distribution of temperature than any other system of refrigeration tried. It is noteworthy that the " jacket " system has already been successfully adopted, in a variety of forms, in a number of recently built vessels."

59. The continuance for 1936–37 of contributions from governments at the existing rates has been recommended by those members of Council repre-

senting contributing governments. Proposals have also been made to those governments to enable the liability for the period 1st October, 1933 to 31st March, 1934 to be met.

Wool Research, Torridon.

60. In this case also the report of the work done in 1935–36 will appear in the annual report of the Wool Industries Research Association.

At the close of the year, as has been stated in paragraph 45, the whole question of co-operation between the Research Wool Industries Association and the chief wool producing Dominions—Australia, New Zealand and the Union of South Africa—was under discussion by the High Commissioners of those countries and the representatives of the Association. A conclusion has since been reached recommending the governments of those represented in those discussions to authorise their delegates at the British Commonwealth Scientific Conference to formulate recommendations on this matter.

The Journal of Dairy Research.

61. The Committee on Dairying of the Imperial Agricultural Research Conference of 1927 came to the conclusion " that the time is not ripe for the establishment of an Imperial bureau " on dairying but suggested that an Empire journal devoted to dairy research might advantageously be started (paras. 144 and 145 of the Conference report). The Conference accepted the proposal for a publication " of an Empire Journal on dairying research pending the establishment of an Imperial correspondence centre in dairying." (para. 26 *ibid.*) With the aid of the Empire Marketing Fund the Journal of Dairy Research was started in 1929. When that fund ceased in 1933 the Council obtained the permission of governments to use funds to the extent of £250 a year to make good any deficiency required in the production and issue of this journal; this arrangement to continue until the matter could be considered at an Imperial Scientific Conference. The administration of the journal—subject to the general financial control of the Council—is vested in a Committee of Management of which Professor H. D. Kay of the National Institute for Research in Dairying, Reading, is Chairman and on which are three members of the Council. The editors are Dr. N. C. Wright of the Hannah Dairy Research Institute, Ayr, Scotland and Dr. A. T. R. Mattick of the National Institute for Research in Dairying, Reading. They are assisted in the selection of papers for publication by leading scientists in all countries of the Empire.

62. Since the journal came under the general supervision of the Council the number of issues in a year has been increased from two to three and the rate of subscription has been raised from fifteen to twenty-five shillings a year No free copies are issued. Each number contains original papers and a

biennial review of the scientific literature, with bibliography on some section of dairying science. The last five numbers (January, 1935 to May, 1936) contained original papers sent in by dairy research workers, in England, Scotland, Wales, Canada, Australia New Zealand and Nigeria.

63. The three numbers a year appear in January, May and September. The number of subscribers continues to increase, and demands for complete back sets are not infrequent.

Number of subscribers.

Vol. I (1930)	192	Vol. IV (1933)	239
Vol. II (1931)	195	Vol. V (1934)	266
Vol. III (1932)	229	Vol. VI (1935)	306

The charge for the year 1935–36 on Council funds was £288 0*s*. 3*d*. This comparatively heavy charge in one year was due to

(i) certain charges attributable to the preceding year's volume being settled in the year 1935–36; and

(ii) Volume VI (1935) being somewhat larger than normal, the preceding volume having been somewhat smaller than normal.

As stated in the report of the Council for 1934–35, no charge had fallen on the Council's funds in that year on account of the journal; instead a credit balance of £65 7*s*. from the journal (see reason (i) above) had accrued. The cost of the journal to the Council funds in the two years 1934–35 and 1935–36 together has therefore been £222 13*s*. 3*d*.

The List of Agricultural Research Workers in the Empire.

64. The Imperial Agricultural Research Conference of 1927 found that the "List of Agricultural Research Workers in the Empire" prepared for that Conference was valuable and "recommended that it should be revised and periodically circulated." The Ministry of Agriculture and Fisheries in the United Kingdom had prepared that list and for the following year or two continued to be responsible for its production.

65. With effect from 1930 the Council took over the compilation as the purpose of the list is to facilitate interchange of information between research workers in different parts of the Empire.

66. The List is a classified one, giving the names and addresses of the agricultural research workers in each country of the Empire, with the subjects in which they are interested but also bringing together under each subject the names of all research workers in that subject. The information is supplied by each country in the Empire as on June 30th of each year. The List for

1935 was the ninth year of its publication. Each person in the list obtains a free copy. Distribution of the 1935 List took place in December. The total number of names of research workers sent in for inclusion increases each year. The approximate number of names in each of the nine lists has been :

Year.	No. of Names.	Year.	No. of Names.	Year.	No. of Names.
1927 ..	.. 1,200	1930 ..	.. 2,450	1933 ..	.. 2,950
1928 ..	.. 1,600	1931 ..	.. 2,750	1934 ..	.. 3,070
1929 ..	.. 2,200	1932 ..	.. 2,900	1935 ..	.. 3,190

CHARLES J. H. THOMAS,
Chairman.

EXECUTIVE COUNCIL, IMPERIAL AGRICULTURAL BUREAUX.

Account of Receipts and Payments for the Year ended 31st March, 1936.

Receipts.

	£ s. d.	£ s. d.
Balance on 1st April, 1935		2,282 7 6
Contributions from Governments of the Empire to :		
Imperial Agricultural Bureaux		20,992 7 6
Various Institutes, etc.	20,672 5 –	
Less paid over	20,509 14 1	
Excess of contributions for 1935/6 retained		162 10 11
Dividends and Interest		753 1 4
Miscellaneous Receipts		– 2 6
Redemption and conversion of Stock :		
£2,000 Natal 3½ per cent. Inscribed Stock	£2,065 4 –	
Less Loss on redemption	65 4 –	2,000 – –
£2,000 New South Wales 3 per cent. Stock (Conversion)		1,935 4 –
		3,935 4 –
Post Office Savings Bank—Net withdrawal		2,213 2 –
		£30,338 15 9

Payments.

	£ s. d.	£ s. d.
Net expenditure incurred by the Imperial Bureau of :—		
Soil Science (Rothamsted)		2,782 – 6
Animal Nutrition (Aberdeen)		3,109 18 3
Animal Health (Weybridge)		3,496 8 –
Animal Genetics (Edinburgh)		1,629 13 5
Fruit Production (East Malling)		2,056 3 3
Plant Genetics (Herbage) (Aberystwyth)		2,748 8 7
Plant Genetics (Non-Herbage) (Cambridge)		2,869 7 –
Agricultural Parasitology (St. Albans)		1,411 1 6
Secretarial Expenses		3,237 14 9
		23,340 15 3
Journal of Dairy Research		288 – 3
Purchase and Conversion of Stock :—		
£2,000 Commonwealth of Australia 3 per cent. Registered Stock 1939/41	£2,024 10 6	
£2,000 Commonwealth of Australia 3 per cent. Registered Stock 1939/41 (Conversion)	1,935 4 –	3,959 14 6
Contributions to various Institutes, etc., received and credited in 1934/35, paid over in 1935/36		1,450 – –
Balance on 31st March, 1936 :		
H.M. Paymaster-General	£4,320 13 2	
Balance in hands of Directors	733 17 8	
	5,054 10 10	
Less outstanding orders	3,847 15 8	
	1,206 15 2	
Add Suspense Accounts	93 10 7	
		1,300 5 9
		£30,338 15 9

Investments at 31st March, 1936 :

£4,000 5 per cent. Conversion Loan 1944/64 at cost	£4,152 16 –
£2,000 3½ per cent. South Australia Stock 1939 at cost	£1,940 4 –
£2,000 4 per cent. Natal Stock 1937 at cost	£2,070 4 –
£4,000 Commonwealth of Australia Registered Stock 1939–41 3 per cent. at cost	£3,959 14 6
Post Office Savings Bank	£7,513 8 8

Note.—The Balance and Investments at 31st March, 1936, include the sum of £3,827 10*s.* 11*d.* held on behalf of Research Institutes.

25th May, 1936.

I have examined the above Account. I have obtained all the information and explanations that I have required, and I certify, as the result of my audit, that in my opinion the above Account is correct. (*Signed*) G. C. UPCOTT,
Comptroller and Auditor General.

(*Signed*) V. H. BOYSE, *Accountant.*

(*Signed*) DAVID CHADWICK, *Secretary.*

IMPERIAL INSTITUTE OF ENTOMOLOGY.

ACCOUNT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 1936.

Receipts.

	£	s.	d.	£	s.	d.
To Balance at 1st April, 1935 :						
Joint Colonial Fund	3,000	–	–			
Crown Agents for the Colonies ..	531	9	1			
H.M. Stationery Office	200	–	–			
Sir Guy A. K. Marshall	16	14	2			
				3,748	3	3
Contributions :—						
Governments of the Empire and Societies	12,342	–	–			
Foreign Governments	175	7	10			
				12,517	7	10
Publications				2,446	8	4
Interest and Dividends				471	4	10
Grant for Locust Research				250	–	–
				£19,433	4	3

Payments.

	£	s.	d.	£	s.	d.
Salaries, Director, etc.				2,379	19	8
Provident Fund				120	–	–
Salaries, Scientific Staff, etc.				5,894	4	9
Provident Fund				295	5	9
Salaries, whole-time Staff				2,592	15	2
Provident Fund				127	6	10
Salaries, part-time Staff				23	8	4
Travelling Expenses				39	18	6
Books, Publications				128	18	11
Bulletins, etc.				1,755	9	3
Stationery, Postages, etc.				153	1	–
Rent, Rates, etc.				365	15	–
Light, Heat, Water, etc.				409	6	4
Laboratory, etc., equipment				8	17	–
Contingencies				388	18	10
Furniture				19	3	3
Redecoration				–	–	–
Locust Research				191	9	2
				14,893	17	9
Balance on 31st March, 1936 :						
Joint Colonial Fund	4,000	–	–			
Crown Agents for the Colonies ..	352	2	3			
H.M. Stationery Office	200	–	–			
	4,552	2	3			
Less Due to Sir Guy A. K. Marshall	12	7	11			
W. & O. Insurance Employees contributions	–	6	4			
Suspense	–	1	6			
	12	15	9			
				4,539	6	6
				£19,433	4	3
Investments on 31st March, 1936 :						
Cyprus 1956/66 Stock 4 per cent.				1,000	–	–
Funding 1960/90 Stock 4 per cent.				2,679	19	–
Jamaica 1952/62 Stock 4 per cent.				1,000	–	–
Kenya 1961/71 Stock 4½ per cent.				1,017	16	8
India 1950/55 Stock 4½ per cent.				1,000	–	–
Nigeria 1963 Stock 4 per cent.				1,000	–	–
Natal 1937 Stock 4 per cent.				1,000	–	–
				£8,697	15	8

(*Signed*) V. H. BOYSE, *Accountant to Council.*

I have examined the above Account. I have obtained all the information and explanations that I have required, and I certify, as the result of my audit that in my opinion the above Account is correct. (*Signed*) G. C. UPCOTT,
Comptroller and Auditor General.

(*Signed*) DAVID CHADWICK, *Secretary.*
Executive Council, Imperial Agricultural Bureaux.

(*Signed*) GUY A. K. MARSHALL, *Director.*
16*th May*, 1936.

IMPERIAL MYCOLOGICAL INSTITUTE.

Account of Receipts and Payments for the Year ended 31st March, 1936.

Receipts.

	£ s. d.	£ s. d.	£ s. d.
Balance on 1st April, 1935:			
Joint Colonial Fund		1,000 – –	
Bank		42 11 –	
Cash		– 15 2	
		1,043 6 2	
Add F.S.S.U. Suspense Account		15 7 7	
		1,058 13 9	
Less Crown Agents overdraft:			
Balance overdrawn	73 3 4		
Cheque uncleared	35 – –		
		108 3 4	
			950 10 5
Contributions			7,292 12 6
Interest			121 14 11
Publications			697 19 3
			£9,062 17 1

(*Signed*) V. H. BOYSE, *Accountant to Council.*

I have examined the above Account. I have obtained all the information and explanations that I have required, and I certify, as the result of my audit, that in my opinion the above Account is correct.

(*Signed*) G. C. UPCOTT,
Comptroller and Auditor General.

Payments.

	£ s. d.	£ s. d.
Director's Salary		1,138 10 8
Superannuation		30 – –
Scientific and Tech. Staff Salaries		3,596 7 3
Temporary Scientific Assistant		45 – –
Superannuation		376 13 4
Whole-time Clerical Staff		600 – 4
Superannuation		34 12 –
Laboratory Attendant		189 4 1
Superannuation		17 10 –
Overtime		5 17 6
National Insurance (Employer's Contribution)		14 14 –
Travelling		2 9 8
Purchase of Books		62 7 9
Issue of Bulletins		858 11 9
Stationery, Postage, Telephone, etc.		89 9 –
Rent, Rates, Insurance		95 9 10
Light, Heat, Water, Cleaning		161 9 10
Laboratory Apparatus		34 3 11
Contingencies		2 18 10
Furniture		7 7 –
Overseas Travel		—
Meetings, Conferences, etc.		30 – –
		7,392 16 9
Balance on 31st March, 1936:		
Joint Colonial Fund	1,500 – –	
Crown Agents	101 18 10	
Bank	36 13 3	
Cash	– 17 7	
Stamps	5 19 5	
F.S.S.U. Suspense Account	24 11 3	
		1,670 – 4
		£9,062 17 1

Investments on 31st March, 1936:
New Zealand 4½ per cent. 1944 .. £2,077 15 4

(*Signed*) DAVID CHADWICK, *Secretary.*
Executive Council, Imperial Agricultural Bureaux,
22nd April, 1936.

(*Signed*) *S. F. ASHBY, Director.*

IMPERIAL INSTITUTE OF ENTOMOLOGY, PARASITE LABORATORY, FARNHAM HOUSE.

ACCOUNT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 1936.

Receipts.

	£ s. d.	£ s. d.
Balance on 1st April, 1935 :		
Crown Agents for the Colonies ..	537 16 11	
Superintendent	6 – 11	
		543 17 10
Contributions from Governments of the Empire	.. ..	5,035 – –
Contributions towards Work on Special Projects	3,128 – 10	
Less Expenditure thereon	2,296 19 2	
		831 1 8
Grant from the Agricultural Research Council	187 10 –	
Less Expenditure therefrom	145 16 8	
		41 13 4
Accommodation of Australian Entomologists		100 – –
Miscellaneous receipts :		
Sales of Parasite Material	10 9 6	
Sales of Stores	2 12 –	
Interest	2 – 3	
		15 1 9
		£6,566 14 7

Payments.

	£ s. d.	£ s. d.
Directional Staff :		
Director	198 6 4	
Superintendent and Assistant Director	1,190 2 –	
Provident Fund	70 – –	
		1,458 8 4
Scientific and Technical :		
Assistant Entomologists	1,344 13 4	
Field Officer	326 8 5	
Provident Fund	84 – 6	
		1,755 2 3
Secretary, Librarian, Accountant		303 19 11
Laboratory Stewards		256 17 6
Caretaker and Gardener		320 4 7
Provident Fund		30 2 9
National Insurance		13 14 9
House Maintenance		85 13 2
Laboratory Maintenance		338 7 10
Rates		75 14 10
Fuel		78 15 11
Electricity		168 6 11
Fire and other Insurances		14 13 11
Motor and Petrol Gas Plant		78 12 9
Travelling, etc.		32 8 8
Shipments and Postal Services		84 19 1
Garden		92 1 6
Library		49 5 3
		5,237 9 11
Balance on 31st March, 1936 :		
Crown Agents for the Colonies ..	775 7 9	
Joint Colonial Fund	500 – –	
Superintendent, etc.	53 16 11	
		1,329 4 8
		£6,566 14 7

(NOTE :—Includes £41 13*s.* 4*d.* balance of grant from the Agricultural Research Council).

(*Signed*) V. H. BOYSE. *Accountant to Council.*
8th June, 1936.

I have examined the above Account. I have obtained all the information and explanations that I have required, and I certify, as the result of my audit, that in my opinion the above Account is correct. (*Signed*) G. C. UPCOTT,
Comptroller and Auditor General.

(*Signed*) W. R. THOMPSON, *Superintendent.*

(*Signed*) DAVID CHADWICK, *Secretary.*
Executive Council, Imperial Agricultural Bureaux.

APPENDIX I

IMPERIAL INSTITUTE OF ENTOMOLOGY REPORT FOR 1935-36

The outstanding entomological event of the past year was the Fourth Imperial Entomological Conference, which was held in London in September, 1935. This was very well attended by overseas delegates, there being 28 in all, representing 20 different countries. Useful discussions took place on eight important entomological subjects, as recorded in the published report of the Conference; and a special Committee investigated and reported upon the general working and finances of the Institute. Apart from the recommendation that two entomologists and one abstractor should be added to the staff to assist in coping with the steadily increasing volume of work, the only new departure suggested was in connection with the termite problem. The very heavy losses caused by these insects in the tropical and subtropical parts of the Empire was stressed, and a thorough investigation of the whole question was urged; but for this some special organisation would be necessary, since such an enquiry would involve a considerable amount of work.

The need for the foundation of a new journal for the publication of papers on Systematic Entomology was also emphasised. Unfortunately the authorities of the Natural History Museum have been unable to help in this respect, and it would therefore be desirable to consider whether it might not be possible for the Institute itself to issue such a periodical.

IDENTIFICATION OF INSECTS

One of the primary needs of the Economic Entomologist working in the field is to secure reliable identifications of the various injurious insects with which he has to deal, for without this the vast and growing literature on the subject must remain as a sealed book to him. The scientific name of the insect is thus the key that renders available the information which that literature contains, and if the name is incorrect the field-worker may be led seriously astray. But it is not only the actual pests that are of importance, because a species which is practically harmless in one country may be a serious pest elsewhere, and the knowledge that it occurs somewhere without doing any damage may be of great value, as indicating that it is being controlled by useful enemies.

The recent development of the method of controlling insects by the introduction of their natural enemies has greatly stimulated the breeding of parasites (principally minute parasitic wasps) by field-workers, and large numbers of these are sent in for naming. It is a new field, and approximately 90 per cent. of the species received are new to science. The classification, description and naming of these very difficult insects can only be done by skilled specialists, and of these there are only seven or eight in the whole world, all of whom are swamped with requests for names.

Increasing attention is also being given to the investigation along ecological lines of the causes that lead to periodic outbreaks of insects, and this necessitates the identification of many species that are not of direct economic importance, because of their probable interrelationships with known pests.

The rapid development of aerial transport is likewise giving rise to fresh entomological difficulties, since it affords a ready means of carrying living insects into new areas where they may develop into agricultural pests or transmitters of disease. During the past year the Institute has received for identification from Kenya and the Sudan fairly large collections of insects found in aeroplanes, and this is obviously a line of work that is likely to grow rather rapidly in the near future.

That the identification service of the Institute is fully appreciated by entomologists is sufficiently indicated by the figures given below. During the past year 552 lots of insects were sent in by 207 different correspondents, who were geographically distributed as follows :— Africa 53, America 17, Asia 55, Europe 63, and Oceania 19. These collections contained 101,728 specimens, the annual average for the previous five years having been 98,532. The list of identifications issued totalled 359, comprising 7,270 specific names. The actual numbers of identifications sent to the various Dominions, Colonies and other territories are as follows, the average for the previous two years being given in brackets for comparison :—

AFRICA	Union of South Africa	181	(90)	
	Southern Rhodesia	101	(98)	
	Sudan	415	(532)	
	Gold Coast	66	(32)	
	Kenya Colony	455	(864)	
	Nigeria	501	(433)	
	Nyasaland	59	(33)	
	Sierra Leone	310	(451)	
	Uganda	143	(639)	
	Tanganyika Territory	343	(143)	
	Other Territories	120	(413)	2,694
AMERICA	Canada	—	(155)	
	West Indies	95	(291)	
	Other Territories	84	(199)	179
ASIA	India and Burma	814	(835)	
	Ceylon	24	(40)	
	Cyprus	64	(167)	
	Malaya	625	(343)	
	Palestine	407	(411)	
	Other Territories	903	(733)	2,837
OCEANIA	Australia and New Guinea	207	(369)	
	New Zealand	86	(107)	
	Fiji	80	(143)	
	Solomon Islands	335	(369)	
	Other Islands	31	(95)	739
EUROPE	United Kingdom	427	(468)	
	Other Countries	394	(321)	
				821
				7,270

In addition to our identification work for Empire countries a good deal is also done for foreign countries. The receipt of insect pests from these latter sources often gives us useful information which it would otherwise be difficult to obtain. Furthermore, it would be impossible for us to maintain our indentification service on anything like its present scale if it were not for the generous voluntary help we receive from a large number of foreign specialists. Our work for foreigners may therefore be regarded as some return for this valuable assistance; and in any case such friendly international cooperation is something that seems to be in itself desirable.

From the collections received thousands of named specimens are of course returned to the senders; but in addition to this, 40,500 (15,200) insects have been handed over to the British Museum, of which 414 (348) were types of species new to science, and among the remainder were 614 (739) named species not previously represented in the National Collection. Some

1,450 named specimens were also presented to the Royal Veterinary College, London, for teaching purposes.

REVIEW OF APPLIED ENTOMOLOGY

Dr. Neave reports that the 23rd volumes (1935) of the two Series of the *Review of Applied Entomology* were the largest on record, whether they are reckoned on the number of pages in them or the number of abstracts that they contain. Exclusive of indices (probably about 180 pages), the 1935 volumes contain 1,096 pages as compared with 993 in 1934 and 1,022 in 1931 (the previcus highest record). The number of abstracts and titles that they contain is 2,901 as compared with 2,772 in 1934 and 2,832 in 1931.

It will thus be seen that the growth in the World's entomological literature that was anticipated in recent reports, as soon as economic conditions improved, is being realised. Moreover, there are indications that this is becoming still more marked in the present year. Consequently the struggle to keep the *Review* as completely up to date as it has been in the past becomes more difficult and is likely to continue to be so until the additional abstracting staff, recommended at the Fourth Imperial Entomological Conference, can be provided.

The figures of sales are extremely satisfactory and are of special significance in view of the fact that the volumes under report are the first to be affected by the material increase in subscription rates that came into force in January, 1935. Though it might have been anticipated that this would have somewhat reduced the number of subscribers, this did not in fact occur. In the case of the Series " A " they increased from 565 to 571 and for Series " B " from 430 to 436. There was also a reasonably good demand for back volumes, and as a result of the new rates of subscription the receipts rose to no less than £1,282 17*s*. 5*d*. during the calendar year 1935, as compared with £901 0*s*. 11*d*. in 1934, and an average of £806 for the previous five years. For the first time, therefore, the receipts have more than covered the mere cost of printing and postage.

These facts afford a practical demonstration that the publication of the *Review* is really essential for the work of Economic Entomologists, and from time to time we receive from many parts of the world gratifying personal acknowledgments of its value.

BULLETIN OF ENTOMOLOGICAL RESEARCH

Volume 26, published in 1935, was only slightly smaller than that for the preceding year, comprising 617 (624) pages and 24 (21) plates, owing to the inclusion of two exceptionally long papers : one by Mr. T. H. C. Taylor on the successful control of predators in Fiji of a serious scale-insect pest of coconuts; and a valuable account by Dr. J. G. Myers of his investigations on the biological control of insect pests in the West Indies. Towards the cost of publishing the latter paper the Governors of the Imperial College of Tropical Agriculture, Trinidad, kindly contributed a sum of £25.

The 44 papers contained in the volume have, as usual, emanated from a wide range of countries, viz. :—United Kingdom 11, Australia 2, Union of South Africa 1, New Zealand 1, Southern Rhodesia 1, India 5, Federated Malay States 3, Fiji 1, Jamaica 1, Kenya 3, Nigeria 2, Palestine 1, Tanganyika 1, Uganda 1, West Indies 2, Brazil 1, Iraq 1, Russia 4, Sweden 1, United States 1.

In this journal also there has been a satisfactory rise in the numbers of subscribers viz. :— 381 as against 362 in the previous year. Owing, however, to a fall in the sale of back volumes, which is always a fluctuating figure, the receipts during 1935 were somewhat less, £820 7*s*. 5*d*., as against £896 12*s*. 10*d*. in the previous year. Nevertheless the sales still show a satisfactory margin over the total cost of production, which amounted to £701 12*s*. 6*d*. for printing, illustrations and postages.

ZOOLOGICAL RECORD PART INSECTA

The part of this annual work relating to " Insecta " and dealing with the literature for 1934, which is prepared by the Institute on behalf of the Zoological Society of London, appeared as usual in July. It was exceptionally large owing to a special effort having been made to

include a large number of records, particularly those relating to new genera, that had been omitted from earlier volumes. It contains 3,405 titles and occupies 488 pages, the corresponding figures for the previous year having been 3,235 and 443.

The number of subscribers was 122, and the sales produced a profit to the Institute of £54 4*s*. 0*d*. after deduction of amounts due to the Zoological Society of London. To this must be added the annual contribution of that Society to the Institute's funds towards the cost of production, namely, £100.

OTHER PUBLICATIONS

The Zoological Society of London is also contributing £50 per annum to the funds of the Institute, for the years 1935–37 inclusive, and paying all the expenses in respect of the production of a new "Nomenclator Zoologicus," which is being prepared under the direction of Dr. Neave. Work on this large undertaking was begun in February, 1935, and had made considerable progress by the end of the year.

GENERAL INFORMATION SERVICE

As an indication of the kind of enquiries that have been received and reported on during the year the following examples may be cited :—

The Chief Entomologist, Union of South Africa, sought advice as to the possible risk of introducing insect pests into the Union in timber imported from the Belgian Congo.

The Colonial Sugar Refining Co. in Australia was advised regarding the control of the weevil borer of sugar-cane.

The High Commissioner for New Zealand was promptly informed of the discovery in Malaya of the first known parasite of *Oryctes rhinoceros*, which is a serious pest of coconuts in Samoa and also constitutes a menace to Fiji.

The Chief Entomologist, Southern Rhodesia, was supplied with a full specification of the apparatus for experiments with constant temperatures and humidity used in the Institute's locust laboratory.

Various enquiries were received on behalf of the Imperial Council of Agricultural Research, India :—On the possible biological control of the *Pyrilla* that attacks sugar-cane and other crops; on the occurrence of the Coffee Berry Borer (*Stephanoderes*) in the Dutch East Indies; on the biological control of the Cotton Stem Weevil (*Pempheres*) in South India. Advice was also given on the proposed tour of the Assistant Imperial Entomologist in America and the Far East in connection with biological control.

The Director of Agriculture, British Guiana, enquired as to the possible risks of importing Broom Corn from South Europe for broom-making. An opinion was further asked regarding certain local investigations into methods of protecting stored rice from weevils, and also the possibility of controlling the *Brassolis* pest of coconuts by the artificial increase of local parasites.

The Veterinary and Agricultural Officer, British Somaliland, was informed as to the best methods of controlling *Calandra* in locally grown grain.

For the control of the Carob Midge in Cyprus a programme of likely lines of investigation was drawn up for the Government Entomologist, and the Chief Entomologist in Greece also agreed to have a similar investigation made in that country.

Both Kenya and Uganda raised the question as to whether there was any risk in importing the notorious Corn Borer (*Pyrausta*) in Italian ships from Eritrea, and reports on the subject were sent out.

Correspondence also took place with the Deputy Director, Plant Industry, Kenya, regarding the arrangements to be made for an entomologist to visit Asia in search of parasites of the Coffee Mealy-bug, and various recommendations were made.

Advice was given regarding damage done to potatoes by the Potato Moth (*Phthorimæa*) in H.M. Victualling Yard, Malta.

A report was prepared on the question raised by the Director of Agriculture, Mauritius, as to the possible risk of introducing pests and diseases if logs of aspen from N. Europe were

allowed to come into Mauritius with the bark on. Various enquiries regarding the control of the Phytalus pest of sugar-cane were also dealt with.

The Department of Agriculture, Nigeria, were advised regarding the best methods of storing native grain against the possibility of shortage arising from drought, etc.

The Government Entomologist, Palestine, was supplied with a list of the countries known to be infested with San Jose Scale, and also a list of references to the literature on Ticks recorded from that country.

The Chief Entomologist, Anglo-Egyptian Sudan, made enquiries regarding the occurrence of mites in stored dates and methods of fumigation.

The Imperial Institute, London, asked whether it would be possible to secure supplies of Cochineal insects within the Empire for commercial purposes.

The British Legation in Persia sought advice on the control of mole-crickets in gardens.

The Director attended an International Committee of Entomologists on House-fly Research, which was held at the London School of Hygiene and Tropical Medicine in December, 1935. Representatives of eight European countries were present, and a general programme of future research was agreed upon.

The Director continued to serve on the Colonial Advisory Council of Agriculture and Animal Health, and on the Committee on Locust Control and Tsetse-fly Committee of the Economic Advisory Council.

LOCUST INVESTIGATIONS

The work of the Institute as the International Centre for Anti-Locust Research, financed from a special fund and supervised by Dr. B. P. Uvarov in addition to his ordinary duties, is developing steadily in several directions.

The main function of the Centre consists in the collection of periodical (in most cases monthly) reports on the locust situation in all the countries of Africa and western Asia. These reports have been received with great regularity and are summarised and mapped by a special technical assistant, Miss W. Milnthorpe. As a direct result of this work, an annual survey on the locust situation during 1934 has been published, and a similar survey for the year 1935 is in course of preparation. In addition to the mapping and analysing of the current information, a start was made during 1935 in the analysis on similar lines of the published and manuscript information relating to previous locust outbreaks in Africa and western Asia. It is hoped that this work will prove of great value in determining whether there is a well established regularity in these outbreaks, as this might be of practical importance for the forecasting of future outbreaks.

The bibliographical work on the locust problem which was begun in 1926 has been continued. The lists already issued bring together 960 titles of papers published in fifteen different languages during the last ten years. A fifth list will be published with the survey for the year 1935.

A beginning has been made in the analysis of meteorological factors determining the location of breeding areas of the swarms of the Desert Locust. This work, requiring as it does a careful compilation of numerous meteorological data, will take some time to carry out, but its results should be of great practical value. Further improvements in this bioclimatic work, which is being carried out by Miss Z. Waloff in addition to her secretarial and bibliographical duties, are assured by the fact that a close contact has been established between the Institute and the Meteorological Office, which is supplying expert assistance and advice on the meteorological aspects of the problem.

Following a special request from the Organising Committee of the Fourth International Locust Conference, a considerable amount of work was undertaken by the International Centre in the second half of 1935 in connection with the preliminary arrangements for the organisation of the scientific programme of the Conference. This work involved correspondence with experts in all parts of the world.

Apart from supplying regular information to a number of field workers in Africa and western Asia on the latest, often unpublished, developments in the study of the locust problem, the International Centre has kept in touch with and has supplied information and advice to entomologists in other parts of the world, such as Australia, China, the Philippine Islands,

Borneo, various States in South America, etc. There is a growing demand for an organised supply of information on the locust and grasshopper problem on a world scale.

The work of the locust laboratory attached to the Institute was continued by Dr. A. G. Hamilton. The first series of experiments on the life-cycle of three species of locusts under various constant conditions of temperature and humidity have been completed during the year and the results published. New experiments have now been commenced in order to study the influence of fluctuating temperatures and humidities. A second important problem of locust physiology, namely the temperature range of various activities of locusts (movement, feeding, etc.) has been studied during the year by Mr. M. Hussein, a research student seconded to the Locust Laboratory by the Egyptian Government, who have also provided funds for the necessary special equipment. Studies on the action of external poisons on locusts were continued by Dr. Hamilton. This work received some financial support from Imperial Chemical Industries Limited, and produced valuable results, which will shortly be ready for publication.

An important function of the Locust Laboratory consists in supplying research workers in University laboratories with live locust material, where investigations are being undertaken on various theoretical problems of locust physiology, cytology, etc. All laboratories working on locusts maintain a close contact with our laboratory, and a list of problems studied by them is kept at the Institute in order to ensure that no overlapping of research occurs. All this work is done by University laboratories at their own expense, except a special research on the behaviour of locusts in response to external stimuli carried out at the Birmingham University by a research student receiving a scholarship grant from the locust fund.

Field investigations on locusts were carried on during the year by four entomologists (one of them a voluntary worker without pay). Investigations on the African Migratory Locust (*Locusta migratoria migratorioides*, R. & F.) in East Africa were conducted by Mr. H. B. Johnston and Mr. D. R. Buxton, and extended over the whole of Kenya and Uganda, as well as to some parts of the southern Sudan, eastern Belgian Congo and western Italian Somaliland. These ecological surveys proved that East Africa as a whole contains no areas where swarms of the Migratory Locust can arise, and invasions are due entirely to swarms arriving from the only known African centre, on the Middle Niger in the French Sudan. This negative finding is obviously of great practical value.

Investigations on the Desert Locust (*Schistocerca gregaria*, Forsk.) were conducted by Mr. R. C. Maxwell-Darling and consisted in surveys of the Darfur Province of the Anglo-Egyptian Sudan, of the Aden Protectorate and the coastal areas of Saudi Arabia, as well as in detailed ecological observations on the Sudanese coast of the Red Sea. It has been definitely proved that the latter area includes important outbreak centres of the Desert Locust, and similar conditions have been found in the Arabian coastal areas. On the other hand, Darfur, like other inland areas of the Sudan investigated earlier, was seen to present no danger in this respect. Thus, a very definite advance of practical value has been made in the study of the Desert Locust also.

Detailed studies of the ecology of the Red Locust (*Nomadacris septemfasciata*, Serv.) were organised by Mr. A. P. G. Michelmore at a special field station at Lake Rukwa, in Tanganyika Territory, which is one of the known centres of origin of the last outbreak of this species. The investigations aim at the discovery of the climatic, vegetational, and other factors which favour the production of the swarming phase of this locust. A great deal of valuable data has been amassed, but the work is still in progress and no final deductions can be expected before the end of another season.

LIBRARY

Accessions during the year numbered 408 volumes and 1,339 pamphlets, and the library now contains 8,848 bound volumes and 22,569 pamphlets.

An analysis of the bound volumes by languages is as follows :—

English ..	4,418	French ..	1,249	Magyar	67
Danish ..	58	Italian ..	389	Polish	33
Dutch ..	312	Portuguese	309	Rumanian	8
Swedish ..	97	Spanish ..	343	Russian	470
German ..	1,075	Finnish ..	29	Other languages ..	91

Parts of 603 serial publications were received during the year, the countries of origin being as follows :—

British Empire :		Foreign :	
United Kingdom ..	56	Europe	168
Overseas	153	Africa	8
		Asia and Polynesia	42
		U.S. and Territories ..	141
		C. and S. America	34

In addition to the daily internal use of the library by staff and by visitors, 770 books and pamphlets were issued on loan, not including 36 items lent to Farnham House Laboratory. Amongst Government Departments and other Institutions borrowing books may be mentioned :—The Department of Scientific and Industrial Research; the British Museum (Natural History); the Imperial Mycological Institute; the Imperial Bureaux of Animal Health, Agricultural Parasitology and Plant Genetics; Rothamsted Experimental Station; East Malling Research Station; the Agricultural and Horticultural Research Station, Long Ashton; the National Institute of Dairying; the Universities of Edinburgh and Leeds; University Colleges at Aberystwyth and Bangor; Armstrong College, Newcastle-upon-Tyne; the Royal Entomological Society of London; the London School of Hygiene and Tropical Medicine; the Liverpool School of Tropical Medicine; the National Central Library; the Wellcome Bureau of Scientific Research; and Imperial Chemical Industries. Books were also sent on loan overseas to New Zealand, the Gold Coast, Tanganyika, India, Palestine, Iraq, Austria, Finland, Germany, Holland and Switzerland.

The catalogue of serial and official publications is maintained up to date and at present comprises 3,400 entries (in quadruplicate). The author-catalogue, which at present comprises about 113,000 cards, is maintained up to date for books and separates. During the year the entomological contents of 212 volumes were catalogued for the author-catalogue, the total arrears being 2,144 volumes of serial publications, or roughly 25 per cent. of the library. It must, however, be borne in mind that a proportion of these arrears have already been catalogued from separates.

SCIENTIFIC PAPERS PUBLISHED DURING THE YEAR BY MEMBERS OF THE STAFF OF THE INSTITUTE.

Bryant, G. E.—A new species of *Epitrix* (Halticinae) injurious to tobacco.—Arb. phys. angew. Ent. Berlin, 2 pp.

Insects of the New Hebrides : Chrysomelidae.—Ann. Mag. Nat. Hist., 15 pp.

Some new Phytophaga from Africa.—Stylops, 4 pp.

Cameron, E.—A study of the natural control of ragwort.—Jl. Ecol., 58 pp.

Ferrière, C.—The Chalcidoid parasites of lac insects.—Bull. Ent. Res., 16 pp.

Two Chalcidoid egg-parasites of *Diprion sertifer*.—Bull. Ent. Res., 3 pp.

Descriptions de deux importants Chalcidiens d'Egypte et de Soudan.—Bull. Soc. Ent. Egypte, 6 pp.

Les Hymenoptères parasites des mouches Tsétsé.—Mitt. schweiz. ent. Ges., 13 pp.

Notes on some bred exotic Eupelmidae.—Stylops, 7 pp.

Un nouveau parasite de *Thrips* de la Suisse.—Mitt. schweiz. ent. Ges., 3 pp.

Gwynn, A. M., and Hamilton, A. G.—Occurrence of a larval Cestode in the Red Locust, *Nomadacris septemfasciata*, Serv.—Parasitology, Cambridge, 5 pp.

Hamilton, A. G.—The relation of humidity and temperature to the development of three species of African locusts—*Locusta migratoria migratorioides*, R. & F., *Schistocerca gregaria*, Forsk., *Nomadacris septemfasciata*, Serv.—Trans. R. Ent. Soc. Lond., 60 pp., 31 tables.

Hamilton, A. G., and Milnthorpe, W.—On an abnormality of the eighth abdominal segment in females of *Locusta migratoria migratorioides*, R. & F.—Proc. R. Ent. Soc. Lond., 4 pp.

JOHNSTON, H. B.—A new grasshopper from the Sudan.—Ann. Mag. Nat. Hist., 2 pp.

MARSHALL, G. A. K.—New Curculionidae from Tropical Africa.—Ann. Mag. Nat. Hist., 22 pp.
New Injurious Curculionidae from Malaya.—Bull. Ent. Res., 5 pp.
Four new Derelominae.—Stylops, 4 pp.

MAXWELL-DARLING, R. C.—The outbreak centres of *Schistocerca gregaria* on the Red Sea coast of the Sudan.—Bull. Ent. Res., 30 pp.
A short reconnaissance of Northern Darfur with regard to *Schistocerca gregaria*.—t. c., 6 pp.

MORRIS, K. R. S., and CAMERON, E.—The biology of *Microplectron fuscipennis*, a parasite of the pine sawfly.—Bull. Ent Res., 12 pp.

UVAROV, B. P.—A new species of the genus *Schizodactylus* from Burma.—Ann. Mag. Nat. Hist., 4 pp.
Three new grasshoppers from S. E. Tibet.—Ann. Mag. Nat. Hist., 5 pp.
Some Orthoptera from the high regions of Mt. Cameroon.—*ibid.*, 5 pp.
Two new Orthoptera from Morocco.—Bull. Soc. Sci. nat. Maroc, 4 pp.
Notes on Acrididae from S. China.—Lingnan Sci. Jl., 3 pp.
The M. Burr collection of Palaearctic Orthoptera.—Eos, 26 pp.
The locust problem and the way to its solution.—The African Observer, Bulawayo, 4 pp.
Locusts and a rational anti-locust policy.—Empire Cotton Growing Review, London, 6 pp.
The locust outbreak in Africa and Western Asia in 1934.—Econ. Adv. Coun. Comm. Locust Control, London, 65 pp., 11 maps.
The Oriental Migratory Locust (*Locusta migratoria manilensis*, Meyen, 1835).—Bull. Ent. Res., 14 pp.

UVAROV, B. P., and HAMILTON, A. G.—Phase variation and rate of development in the Algerian race of the Migratory Locust (*Locusta migratoria*, L.).—Bull. Ent. Res., 4 pp.

APPENDIX II

IMPERIAL MYCOLOGICAL INSTITUTE
REPORT FOR 1935–36

Dr. Butler's report printed in the Fifth Annual Report of the Executive Council of the Imperial Agricultural Bureaux describes the chief activities of the Institute. Work has continued on the same lines, viz.—

i. investigation;
ii. identification;
and iii. the collection and dissemination of information.

2. Investigation is a necessary preliminary to identification in very many of the more obscure genera and species. Identification and the dissemination of information are services of which the objects are obvious. The work of investigation has continued to show species of fungi which have in the past been misplaced. As the record of the year shows, in many instances this work is conducted in close co-operation with mycologists in overseas parts of the Empire. The Institute has continued to be able to obtain the aid of many of specialists in the work of identification, and the numbers of specimens and cultures sent for identification from all parts of the Empire have continued to increase. The number of abstracts and notices of papers noted in the Review of Applied Mycology were over one third more in 1935 than in 1925—ten years previously; and in the same period the number of subscribers to that Review has more than doubled, though in the meantime the annual subscription has been increased from twelve shillings to a guinea.

INVESTIGATIONAL WORK

Studies on critical genera and species of fungi more or less of phytopathological importance have been continued in the year under report.

Dr. Wiltshire submitted a paper for publication on "The original and modern conception of Stemphylium." In it he showed that the genus *Stemphylium* founded on *S. botryosum* had been misinterpreted. The type species is the fungus known in the literature as *Macrosporium sarcinula*, the conidial stage of *Pleospora herbarum*. He proposed that the species now generally placed in *Stemphylium* should remain there for the present but as a separate section and that certain forms manifestly out of place in the genus should be transferred elsewhere. He has in preparation a paper on the species of *Alternaria* on Brassicæ. The two common species parasitic on the hosts of that group have been much confused in the literature and for one of them—*A. circinans*—a much earlier name has been found. A species of *Alternaria* on stocks in Great Britain has been found to be very similar to a species reported on Chinese cabbage in Korea. Thanks to the co-operation of Professor H. S. Fawcett in California in sending specimens much progress has been made in clarifying specific distinctions among the *Alternarias* occurring on *Citrus*.

Mr. Mason has continued his critical studies on the dematiaceous fungi and it is anticipated that data will be available for publication in a third fascicle during 1936–37. He has enough already to typify the genus *Torula* and its segregates *Gliomastix*, *Periconia*, and *Catenularia*, and to attempt an elucidation of the difficult *Graphium-Sporocybe* group. In collaboration with Mr. R. H. Bunting the genus *Zygosporium* has been revised. In collaboration with Mr. C. G. C. Chesters he has commenced a study of the genus *Ceratostomella* Sacc. of which about twenty collections have been made. It has become clear that species of that genus are associated with larvæ of long-horn beetles and not with bark-boring beetles as is the case with the false species of *Ceratostomella* concerned with Dutch-elm disease, the bluing of timber, etc.

A note on *Cercospora bloxami* Berk. & Br. was published during the year. With the co-operation of Dr. R. M. Nattrass in Cyprus the anomalous genus *Alveomyces* Bubak was established as a genuine rust.

In connection with a proposed search for species of *Theobroma* and varieties of cultivated cacao resistant against Witches' Broom disease in South and Central America, a report was made on the fungal wastage and germination of the seeds of an experimental consignment of pods to the Royal Botanic Gardens, Kew, from Trinidad. The pods, carefully picked and disinfected by Mr. Pyke of the Cacao Research Scheme, had been transported by Messrs. Elders and Fyffes, one half at 65°–70°F. and the other half in the banana hold at 53°F. Those carried at 65°–70°F. (13 days) proved to be very free from fungal wastage and the seeds gave a very high effective germination. Those carried at 53°F. were also very free from fungal wastage but the seeds gave very uncertain effective germination varying from nil to ninety per cent. It was concluded that seeds from carefully picked and disinfected ripe cacao pods transported for two weeks at 65°–70°F. can be depended on to germinate very well and grow into robust plants, but that the normal banana transport temperature of 53°F. is a few degrees too low to be followed by reliable germination.

With the co-operation of Professor F. A. Wolf in North Carolina and Mr. D. B. Adam in Victoria who supplied specimens, a study was made of the blue-mould or downy mildew of tobacco in the United States and Australia. Mr. Adam had described and recorded the fungus on tobacco in Victoria as a new species—*Peronospora tabacina* and the American workers had concluded that their downy mildew was the same species. The oospores of the collections from Australia and the United States showed, however, definite differences. The form in the United States, moreover, had been found to infect tomato, eggplant, and pepper, but attempts in Australia to transmit infection from tobacco to those plants had given negative results. The conclusion was reached that the species on tobacco in Australia as it occurs in Victoria is apparently not the same as that in the United States, a view which is shared by Mr. Adam. The seed-bed disease in Australia ranges for some thousands of miles from Western Australia to northern Queensland, so that the possibility of more than one species of *Peronospora* being concerned seems to deserve consideration.

IDENTIFICATION WORK

Specimens and cultures of fungi, including many phytopathogens, have been received in large numbers for identification from all parts of the Empire. Especially noteworthy were many cultures from citrus fruit-rots in South Africa, specimens and cultures from miscellaneous economic plants in Queensland, Sierra Leone and Cyprus and a batch of thirty-two cultures of mostly pathogenic fungi and bacteria from Victoria, Australia.

Among the more interesting identifications were *Pythium complectens* and *P. spinosum* from pineapple roots in Mauritius, *P. myriotylum* from french bean in Sierra Leone, *P. ultimum* from tulip in Western Europe and from *Carica papaya* in Queensland, and *P. butleri* from potato in Cyprus. *Phytophthora parasitica* was isolated from *Gloxinia* from northern England. *Ph. cinnamomi* was identified in cultures isolated from chestnut and from *Erica* sp. in the south of England and a strain of *Ph. syringae* from apple fruit in south-eastern England. *Ph. meadii* was identified in a culture from carnation and *Ph. palmivora* (" rubber " group strain) from *Aquilegia* sp. both being isolations made in Mauritius. An apparently new species of *Phytophthora* was received and isolated from Canterbury bell from northern England and cultures of isolations of a *Phytophthora* from cacao pods were received from Trinidad quite distinct from *Ph. palmivora* and apparently a strain of the " arecaemeadii" group.

Aspergillus fumigatus was identified from the lungs of penguins in a Zoological Garden in Scotland. *Botrytis polyblastis* was received from daffodil flowers in the Channel Islands. *Ustilago avenae* was identified on the leaves of oats from India and *Phomopsis vexans* on eggplant fruits from Jamaica. *Rhizoctonia lamellifera* was identified in culture from a wilt disease of *Pinus* spp. in South Africa. An *Alternaria* on *Zinnia* in the United States and England was identified (tentatively) as *A. macrospora*. A form impinging on *Myrothecium roridum* was recognised on specimens and in isolations from Sierra Leone. A form only critically distinct

from *Coniothyrium diplodiella* was received from grape-vine in India where its perfect stage had been established. *Chalaropsis thielavioides* was received in culture from *Rosa* sp. in Australia.

An isolation from " brown-patch " of turf in Queensland was identified by Dr. Bennett as *Rhizoctonia monteithianum*, his provisional name for the species causing dollar-spot in the United States and little brown-patch in England.

A batch of *Penicillium* spp. isolated from wheat flour in England was studied by Mr. R. H. Bunting, who kindly furnished drawings and descriptions of the species and forms. Miss E. M. Wakefield as in previous years identified many of the larger Basidiomycetes.

The identifications of fungi made at the Institute this year and in preceding years have enabled mycologists in the Colonies and Territories to complete lists of diseases of economic plants. A supplementary list from Tanganyika Territory has been received and will be published in the *Kew Bulletin of Miscellaneous Information*. Lists from Sierra Leone and the Gold Coast have been completed and will be published in the Bulletin. The list for Cyprus is now nearly ready for publication.

INFORMATION SERVICE

Volume XIV of the *Review of Applied Mycology* was issued and the index to volume XIII was published in June, a month earlier than had been feasible in preceding years. Comparative figures for the volumes issued in 1925, 1930, and 1935 and details of distribution at 31st March, 1936 are shown in the accompanying tables. The cost of printing and distributing the *Review* for the financial year was £859 and the receipts from sales amounted to £660 as against the respective estimates of £1,000 and £580. The saving was due, on the one hand, to an appreciable reduction in printer's costs, due to a cheaper method of type-setting introduced during the year, and on the other hand to an increased demand for back volumes and new subscriptions.

The total number of letters sent away was 1,713 (excluding those concerned with the distribution of the *Review*) of which over 600 were replies to specific enquiries for information in the domains of economic mycology and plant pathology. The number of books, pamphlets and reprints loaned during the year was 114, and the additions to the collections of reprints, miscellaneous reports, and other similar publications brought the total to 16,000.

Owing to the bettered financial position of the Institute due to restoration of contributions and some small increases, a special grant of £100 for binding became feasible; this was urgent as serious arrears had accumulated. Equally urgent was the need for more shelving space and a special grant of £30 enabled three stacks of steel shelving to be set up, one in the library which can now take no more, and two on the adjacent landing.

STAFF CHANGES

Owing to the resignation of Dr. Butler from the directorship and his withdrawal at the end of September, the Mycologist (Mr. Ashby) was appointed to the vacant post as from the 1st October and the Assistant Mycologist (Mr. Mason) was appointed Mycologist. The Assistant Director (Dr. Wiltshire) took over the editing of the *Review* and the Mycologist in the Gold Coast (Mr. H. A. Dade) joined the staff at the end of October as Assistant Mycologist and Sub-Editor. During October Mr. R. H. Bunting gave temporary help with the *Review*. The increasing demand from Empire countries for identifications of specimens and cultures of fungi in large part those injurious to economic plants and the need for further taxonomic studies makes the appointment of another Assistant Mycologist, able to give all his time to such work, urgent, but the financial position of the Institute was not felt to be strong enough to make the appointment during 1935–36. Provision was made for it in the Estimates for 1936–37 but consideration has been deferred considering the financial position.

MISCELLANEOUS

A committee of the Imperial Mycological Conference which met in 1929 recommended that a series of handbooks dealing with the diseases of the most important tropical crops be undertaken and that the Institute be requested to co-operate in their preparation (Report of the Second Imperial Mycological Conference, Appendix IV, 1930). This request has been met in part by the

publication in 1934 of " The Diseases and Curing of Cacao " by Professor H. R. Briton-Jones and by the publication in 1935 of " The Diseases of the Banana and of the Manila Hemp Plant " by Dr. C. W. Wardlaw, a comprehensive work which Mr. Ashby reviewed in " Tropical Agriculture." Dr. Wardlaw was able to acknowledge the help received from the Institute in regard to identifications of the pathogenic fungi and the bibliography. Mr. A. Sharples, for many years Mycologist in Malaya, has used the Institute and its resources in the preparation of his book on the " Diseases of Rubber " to be published shortly and Professor Briton-Jones, who is engaged in the preparation of a book on the diseases of the Coconut Palms, has received help from the Institute with the bibliography.

The inspection of banana plants passing through quarantine in the special glasshouse at Kew Gardens for transmission to Trinidad has been continued as has also the inspection of cacao plants raised from seed at the Gardens for the West African Colonies.

At the Third Imperial Mycological Conference held in 1934 a resolution was passed recommending the adoption of a uniform health certificate throughout the Empire to accompany plant imports and a form of certificate was drawn up and published in the Report of the Conference (p. 9). The form of certificate brought to the attention of the respective Governments through the proper official channels has been widely accepted.

COMPARATIVE FIGURES RELATING TO THE REVIEW OF APPLIED MYCOLOGY

	No. of pages per volume (excl. index)	*No. of abstracts and notices*	*No. of copies printed.*	*Price per vol.*
Volume IV, 1925	768	1,450	1,000	12*s.*
Volume IX, 1930.. ..	816	1,634	1,250	18*s.*
Volume XIV, 1935 ..	816	1,929	1,250	21*s.*

DISTRIBUTION

	Free	*Subscribers*	*Exchange*	*Total*
Volume IV, 1925	258	286	170	714
Volume IX, 1930	260	480	174	914
Volume XIV, 1935 ..	248	586	160	994

APPENDIX III

IMPERIAL BUREAU OF SOIL SCIENCE REPORT FOR 1935–36

GENERAL

There have been no changes on the personnel of the Staff nor in the policy pursued by the Bureau. The past year has been one in which the Bureau has consolidated the position won during the preceding years, and there can be no doubt that its value as a clearing centre for information is now recognised not only throughout the British Empire, but in many foreign countries as well.

THE INDEX

Over 3,000 papers, representing a considerable increase on previous years, were abstracted and indexed. One of the greatest difficulties in keeping a classified scientific card index up to date is to allow for changes in points of view. Papers classified to suit the 1930 outlook are often in the wrong place in the Index to be of the greatest use in 1936. This is particularly true of a young science like agriculture in which also, as in other branches of learning, the world outlook has been profoundly changed by recent economic and political events. It was felt, indeed, that the Index was getting out of date, and a complete revision has been undertaken, and will be completed shortly. The revision involves the separate scanning of over 30,000 cards, but so many changes have had to be made in the classification of the cards that there can be no doubt about the need for it. Due regard has been paid to probable future trends in soil science, and it is hoped that another revision will not be necessitated for many years. The opportunity has also been taken to discard many references, now valueless, and thus check the growing cumbersomeness of the Index.

THE BIBLIOGRAPHY OF SOIL SCIENCE

The " Bibliography of Soil Science, Fertilisers and General Agronomy, 1931–34," issued in August, 1935, is the most ambitious publication yet sent out from the Bureau. It consists of over 6,000 classified references, taken from the first 41 monthly lists of " Publications relating to Soils and Fertilisers " (*i.e.*, to December, 1934) and is thus an epitome of the most recent and complete section of our Index. The book contains, besides the Bibliography itself, a concise explanation of the Decimal Classification, exhaustive subject and author indexes, and a list of about 800 journals from which the references have been taken. It has been very well received, the chief complaint being that it only covers the literature of four years. It would not, however, have been satisfactory to include an earlier period for which the Bureau's index was incomplete, and it is hoped that by the issue of subsequent bibliographies at suitable intervals gradually to build up a complete reference library, accessible to all, of the whole literature of soil science and crop culture over an extended period of time.

TECHNICAL COMMUNICATIONS

No. 32, " Tea Soils," by H. H. Mann, and No. 33, " Organic Manures," by S. H. Jenkins, were issued in the year under review. The first edition of No. 32 was sold out within three months, and a reprint has been made. No. 31, " Soil Deficiencies and Plant Diseases," issued in 1934, has also been reprinted, owing to the continuing demand for it.

OTHER PUBLICATIONS

The series of " Publications relating to Soils and Fertilizers," " Monthly Letters " and " Recent Developments in Soil Analysis " (quarterly) have been continued, and have considerably increased their circulation. As usual, the Bureau has issued to all on the free list a reprint of E. M. Crowther's annual report on the progress of applied chemistry in soils and fertilisers. Recipients of " Publications relating to Soils and Fertilizers " have also received quarterly summaries of recent departmental and institution reports, and lists of reprints available on loan.

SALES OF PUBLICATIONS

A satisfactory feature of the year has been the growing demand for the Bureau's publications, as shown by the following figures for sales. The corresponding figures for the preceding year are given in brackets.

Technical Communications	.. £168 14*s.* 1*d.*	(£43)
Publications relating to Soils and Fertilizers, etc.	.. £75 17*s.* 8*d.*	(£34)
Bibliography of Soil Science	.. £153 11*s.* 5*d.**	

* 8 months.

Besides the publications sold, 318 copies of Technical Communications and 168 copies of " Publications relating to Soils and Fertilizers " are regularly distributed free within the British Empire. Exchange arrangements have been made with several foreign institutions.

SUPPLY OF INDEX CARDS

In November, 1935, the Bureau offered to supply replicas of any or every section of its Index to individuals and institutes wishing to have private card-indexes to soil literature. The cards are despatched, ready classified according to subject, and a charge of five shillings per hundred (including postage) is made. During the five months in which the service has been operating, 6,100 cards have been supplied.

ENQUIRIES.

99 technical enquiries were received during the year. Their sources were distributed as follows (figures for 1934–5 in brackets).

Africa	16	(22)
America	11	(13)
Asia	15	(14)
Australia	14	(16)
Europe	43	(39)
	99	(104)

LOAN LIBRARY.

397 new reprints were received, and 132 were sent out on loan. The loan library now contains over 2,800 reprints. All additions sent by authors will be deeply appreciated.

THE THIRD INTERNATIONAL CONGRESS OF SOIL SCIENCE

This important Congress, held by the International Society of Soil Science, took place in Oxford in July and August. Much of the organisation work had devolved upon the Bureau and the undoubted success of the Congress was therefore gratifying. In spite of the difficult economic position in many countries, over 400 delegates, representing 50 countries, attended. The overseas Empire contributed between 70 and 80 members representing 20 countries—an extremely satisfactory number compared with the previous international soil congress in 1930 when scarcely a single Empire delegate attended. One of many valuable consequences of this good attendance from the Empire was that the attention of the Congress was noticeably drawn

to tropical soil problems, which, it was agreed, should form one of the main themes of discussion at the Fourth Congress in 1940. The Bureau was able to renew many old, and make many new, contacts with both imperial and foreign workers. The value of such personal contacts is inestimable in promoting that inter-imperial co-operation which it is the Bureau's policy to foster, and which should extend into the wider sphere of international scientific co-operation. That numerous opportunities exist for international co-operation in soil and agricultural sciences but that few have been taken was very evident at the Congress, and in this connection it may be permissible to draw attention to the existence of a British Empire Section (secretary : Dr. E. M. Crowther, Rothamsted Experimental Station) of the International Society of Soil Science. Membership affords a ready means of keeping in touch with soil scientists throughout the world and enables the member to participate in the several schemes for international research which are carried out under the auspices of that Society. For some years, South Africa has had its own section, and during the past year the Indian Society of Soil Science, affiliated to the International Society, has been constituted.

CONCLUSION

During the first half of 1935, preparations for the Soil Congress absorbed much of the Bureau's attention, nevertheless we were able to extend our normal activities most markedly in every direction. The preparation of the Soil Bibliography was a big additional task, but its reception has already justified the labour spent on it, and we have every hope of being in a position to issue a continuation volume in 1938. The Soil Congress exposed a considerable ignorance of the Bureau's activities both in British and foreign countries. Consequently, in November 1935 an eight-page informative booklet about the Bureau was issued and supplies sent to Official Correspondents with a request that the booklets be distributed to all parties interested or likely to be interested. Several Official Correspondents wrote for further supplies of the booklet, and it is to be hoped that practically every soil research worker in the Empire is now aware of the services offered by the Bureau.

DETAILS OF THE MONTHLY LIST OF PUBLICATIONS RELATING TO SOILS AND FERTILIZERS

Year.	*No. of pages.*	*No. of entries (estimated)*
1931	120	1,500
1932	220	2,000
1933	250	2,200
1934	350	2,750
1935	450	over 3,000

APPENDIX IV

IMPERIAL BUREAU OF ANIMAL HEALTH REPORT FOR 1935–36

The Imperial Bureau of Animal Health was opened in October, 1929.

SCOPE

The functions of such a bureau have been defined as " to collect, collate and disseminate information of a scientific and technical character; to reply to enquiries on scientific and technical problems from agricultural departments and scientific workers in any part of the Empire; and, particularly, to facilitate intercourse among groups of workers on closely allied problems."

The interests of the Imperial Bureau of Animal Health may be roughly defined as those related to research, public health, administration, education and other aspects of veterinary science. All information is collected relating to the principles involved in the progress, recognition, prevention and treatment of disease in animals, and to curative measures that have wide-scale application. No attempt is made to deal with what may conveniently be termed ordinary clinical work.

The discussions which took place at the Imperial Agricultural Research Conference in London in 1927, and the developments which followed that Conference, have been given full consideration in arranging the work of the bureau. Now that the bureau is functioning, the position of a research or other worker with regard to tracing the published work relating to animal disease is very different from what it was in 1927. The difficulty concerning current work has been removed: that relating to publications issued prior to 1930 is, however, unfortunately not very different from what it was in 1927. This is important, as the dissemination of knowledge relating to current literature only provides a part of the service required by the clientèle.

The work of the bureau has deliberately been built up slowly. The economic depression of recent years has had considerable influence on development as, apart from the effects of the difficult financial times in other directions, it has seriously diminished the amount of money that could be collected from the sale of publications. Further developments are contemplated, but it has been necessary to establish one service fully before another could be dealt with. In consequence, the development of many possible activities has been postponed.

DIVERSITY OF INTERESTS

It is unnecessary to emphasise the diversity of the interests to be served. The important problems of one country are of no importance to another. A good example is contagious bovine pleuro-pneumonia, which is of major importance in Australia and in parts of Africa on account of the great difficulty in its control. It is absent from North America, and the only interest on that continent is its exclusion. Foot and mouth disease occupies a very similar position. Tropical trypanosomiasis is one of the biggest causes of animal loss in many parts of the Empire. Certain of the most important diseases are limited to the African continent and are, therefore, of relatively little interest to the territories in the other parts of the world.

A good example of the need for adequate comparison of methods is in the use of rinderpest virus obtained by the infection of goats for immunisation of cattle. The use of such virus has proved to be immensely useful in India. African workers, on the other hand, have found that, in their conditions, such virus does not give comparable results. A further example of this nature is the behaviour of cattle in the Sudan and West Africa respectively when inoculated with culture vaccine prepared from the causal organism of contagious bovine pleuro-pneumonia.

The vaccine used with success and without undue danger in the Sudan has proved to be quite unsuitable and dangerous in West Africa.

ACTIVITIES OF THE EARLY YEARS

The earlier years were taken up with the development of systems for the execution of the work, the recruitment and training of the necessary staff, the making of contacts, the building up of the library and surveys of the literature to be covered.

It is unnecessary to emphasise the need for accurate and systematic methods in an institution responsible for disseminating reliable information. The development and final choice of systems for the different complex branches of the work have taken up much time, but most of it is now standardised and a matter of routine.

The surveys of the literature produced throughout the world have been very comprehensive. Every conceivable list of publications has been completely searched, such as the original " World List of Scientific Periodicals," " Index Medicus," " The Index Catalogue of the Library of the Surgeon-General's Office, U.S. Army," " Experiment Station Record " the " Ellenberger-Schultz Jahresbericht der Veterinär Medizin," and many others. Letters have been sent to all possible departments and institutions asking for the necessary information, and individuals from all countries have been consulted.

The first fruits of this survey—a list of publications that the bureau would search systematically, was published in the January, 1933, issue of the *Veterinary Bulletin*, and continuation lists have been inserted in each subsequent January issue. When publishing these lists, invitations have been included for suggestions regarding additions or deletions. The same invitations have been issued officially to the correspondents of the bureau.

COLLECTION OF INFORMATION

This side of the work falls under the following heads :—

I. The regular search of all relevant current publications.

II. The maintenance of adequate and suitable " contacts," covering political territories, subjects, etc.

I. *Published Information.*—There is little point in giving numbers of publications searched. They run into many hundreds. It is estimated that the bureau staff scrutinises the titles of between a quarter and half a million scientific articles annually. About 10,000 articles are indexed each year for the purpose of *Index Veterinarius*, and about one-third of them are abstracted for the *Veterinary Bulletin*.

A table at the end of this report shows roughly the number of references that are indexed annually on certain important subjects.

II. " *Contacts.*"—Care has been taken to build up contacts with large numbers of persons in various positions in all parts of the world, in order that they may easily be approached, and be likely to render useful assistance when information is required.

DISSEMINATION OF INFORMATION

Dissemination of information is effected at present by the publication of (I) *Index Veterinarius :* (II) the abstracting journal—the *Veterinary Bulletin :* (III) special reports—a monograph series, and (IV) direct replies in the course of correspondence.

I. *Index Veterinarius.*—Three volumes of *Index Veterinarius* have been published. They have been prepared on a duplicator, and bound with a printed cover. From Vol. 4 onwards, *Index Veterinarius* is being printed.

Index Veterinarius deals fully with the literature of 1933 onwards, and an attempt is made to ensure that it is complete. The titles selected for indexing are classified under subjects, and are heavily cross-referenced. The subject headings and the names of the authors are placed in alphabetical order, so that in each number a search of a single alphabetical series, with a supplementary series for anonymous articles, yields all the information available.

Each quarterly number of *Index Veterinarius* includes the indexing done by the bureau during the quarter prior to issue. The Index is produced promptly, and thus disseminates the information collected with a minimum of delay. The dates of issue are as follows :—

Indexing done during quarter ended	31st March	.. ..	15th June.
,, ,, ,,	30th June	.. ..	15th Sept.
,, ,, ,,	30th Sept.	.. ..	15th Dec.
,, ,, ,,	31st Dec.	.. ..	15th March of the year following.

II. *The Veterinary Bulletin.*—The *Veterinary Bulletin* is issued monthly. The first volume was published in 1931, but the first two volumes do not cover all the literature. As in the case of *Index Veterinarius*, the literature is covered completely from 1933 onwards. Over three thousand abstracts a year are now dealt with, and every endeavour is made to ensure that the abstracts contain the maximum of information required.

The abstracts are mostly prepared by specialists on the questions concerned, working in various institutions, and are edited at the bureau. The bureau staff prepares about one-tenth of the abstracts.

The Official Correspondents of the bureau have, with odd exceptions, accepted responsibility for the preparation of abstracts of publications issued in their respective territories. The system works splendidly and a stream of good abstracts arrives every week from all parts of the Empire. As a means of liaison, details of references abstracted in the bureau are sent off each week to the various territories. The bureau and those concerned in the different territories can then check up to ascertain that the work is completely covered.

A very large number of people have been invited to collaborate in the preparation of abstracts. They have been selected because of their special knowledge of a particular subject, combined, in many cases, with a knowledge of particular languages. About 100 different persons contribute abstracts.

Great emphasis is given to the value of the subject index provided with each volume : it is very comprehensive and heavily cross-referenced, as the index to an abstracting journal gets such permanent heavy use.

III. *The Publication of Special Reports.*—So far, no reports have been issued, but at least two will be published during the present financial year, both being ready for printing.

It is considered that there is an urgent need for the publication of reviews on certain subjects of outstanding importance on which it is difficult for the ordinary person to feel that he is in possession of all the necessary information. Reviews on such subjects, including complete bibliographies, are of immense service, as they can serve as complete guides to the literature concerned up to the end of the period covered, and be adopted as starting points for those who take up the subject.

IV. *Direct Replies in the Course of Correspondence.*—The bureau undertakes the collection of special information when required. When requests are received, special steps are taken to obtain the information, involving enquiries from experts in the subjects concerned and search of the relevant literature. This frequently implies the expenditure of considerable time on the part of the bureau staff, including visits to special libraries, etc. In preparing replies, extensive use is made of the supply of photostat copies at cost price and the loan of reprints.

Of the 250 odd special enquiries dealt with in the six and a half years to date, rather more than one-third came from workers in the overseas Empire, a few came from foreigners, and rather less than two-thirds from workers in the British Isles.

The list of subjects of enquiry attached to this report shows the special enquiries that have been dealt with.

TRANSLATIONS AND LONG ABSTRACTS

There is a need for the provision of translations and long abstracts which, at present, the bureau is unable to supply, except when an enquirer specifically agrees to the expenditure of an agreed sum of money.

INCIDENTAL UTILITY OF BUREAU PUBLICATIONS

One particularly valuable function of bureau publications is their provision of a permanent annual review of progress. Anyone responsible for lectures can easily ensure that he is really up to date by using the *Veterinary Bulletin :* the comprehensive subject index provided in such a journal also serves to give a bird's eye view of the research work, the results of which have been recently published throughout the world.

LIBRARY

It is unfortunately the case that there is not as yet a thoroughly good veterinary library in this country. One great difficulty in dealing with the work of the bureau all along has been the lack of reasonable library facilities. Make-shift methods have been adopted, and access to a very large proportion of the literature has been effected by means of visits to various scientific libraries in London. Borrowing has all along been pushed to the furthest possible limits, but there are great objections to the maintenance of such work by means of regular heavy borrowing.

Reprint Collection.—A collection of reprints is being built up. In the course of the general indexing a note is made when it is considered that a reprint of a particular article would be of value, and a printed card is then sent to the author asking for three reprints if possible. These are available for lending.

It is hoped that this reprint service will be of immense value, as the loan of reprints should often save the purchase of expensive publications or provide access to articles which might be out of print or otherwise inaccessible.

The reprint collection is already quite large and very valuable. It includes a splendid collection of University theses and inaugural dissertations from continental sources going back, in most cases, for many years.

The Sir Arnold Theiler Collection.—Sir Arnold Theiler presented the bureau with a magnificent collection of classified reprints. These have been made a separate section labelled " The Sir Arnold Theiler Collection."

Annual Reports.—Every effort has been made to get collections of annual administrative reports of veterinary departments and of other relevant organisations. The bureau has been very fortunate with regard to donations of large series of older reports from various sources.

CONFERENCES

The most important veterinary conference is the International Veterinary Congress held every four years. The last one was held in 1934. The 2nd International Congress for Microbiology, which takes place in July this year, is also a very important congress from the point of view of the bureau.

MISCELLANEOUS ITEMS

The Deputy Director served on the abstracting committee of Aslib, and is Secretary to the committee of the Agricultural Research Council for Brucella Infection in Animals and Man. The bureau organisation has been of great assistance in connection with the editorial committee of a scientific journal and the library committee of a scientific institution on which he serves.

WORK FOR SPECIAL BODIES

The Agricultural Research Council required bibliographies of certain subjects dealt with by their Animal Disease Committees and in 1933 made a donation of £250 to Imperial Agricultural Bureaux for the purpose. The bureau prepared extensive bibliographies in collaboration with the secretaries of the committees on bovine contagious abortion, bovine mastitis, swine fever, diseases of young swine, Johne's disease, anaerobic infections, avian coccidiosis and fowl paralysis.

The preparation of these bibliographies is work for which the organisation of a bureau is peculiarly suited as it can be done systematically and with the greatest saving in fruitless effort, so that the " cover " of the literature selected can be guaranteed and, with the special knowledge of a bureau as to where each of such a wide selection of publications can be consulted, the time

devoted to the work is all productive: moreover much of this work can be done by the trained lay staff of the bureau.

CERTAIN IMPORTANT ANIMAL DISEASE PROBLEMS

When such a wide range of important subjects is dealt with, there is some difficulty in picking out any of outstanding interest without giving the impression that others are unimportant.

A class of subject of world-wide interest is the relation of animal disease to human health. Of the diseases of temperate climates, the control of tuberculosis and of bovine contagious abortion are outstanding examples.

Very rapid progress is being made with regard to certain virus diseases : outstanding examples are the diseases of the influenza type. A virus has been isolated from swine influenza which, on study, has been found to be very closely related to that of human influenza. Certain, " pneumotropic " viruses are now spoken of, including the viruses of human and swine influenza, the virus of equine influenza and the virus of equine infectious bronchitis. Another very important group of viruses—the " neurotropic " group—is under active world-wide study : it includes certain diseases of great importance in animals and in man. During the last few years, a new important disease called equine encephalomyelitis has made its appearance in the United States of America. It has been proved that it is caused by a virus, and two types of virus have been isolated, spoken of as the eastern and western types respectively. A similar disease occurs in the Argentine and in Russia. Equine infectious anæmia is an exceedingly important virus disease on the continents of Europe, America and Africa, and appears to be spreading to a serious extent. The real incidence of the disease throughout the world is by no means clear. It has not been found in the British Isles.

Of the diseases of tropical and semi-tropical climates, rinderpest still causes great losses. It is chiefly of importance in the less-settled territories, and social conditions prevent the rapid eradication that would be effected in more settled countries. Great progress has been made during recent years in dealing with the disease by the method of conferring active immunity. In this connexion certain other specific infections, derived from the donor of the blood containing the virus, and also in the animal itself being immunised, complicate the problem of conferring protection. Research on improving the methods of vaccination is in progress in many laboratories.

Important advances in knowledge are reported every year in connexion with trypanosomiasis and piroplasmosis. German workers are making great strides with regard to chemotherapy, an outstanding example being the value of acaprin (" dimethylquinolyliummethylsulphate urea ") for the cure of piroplasmosis.

DETAILS OF THE VETERINARY BULLETIN

	No. of pages.	*No. of abstracts and references.*
Vol. I.	382	850
„ II.	772	1,587
„ III.	814	2,285
„ IV.	849	2,670
„ V.	911	2,875

LIST OF SUBJECTS OF SPECIAL ENQUIRY

Mastitis—1
Strangles—1
Anthrax—6
Tuberculosis—16
Johne's Disease—3
Fowl Cholera—3
Swine Erysipelas—1
Glanders—1
Necrotic Enteritis—1
Bacillary White Diarrhœa—2
Br. abortus Infection—10
Lamb Dysentery—1
Pulpy Kidney Disease—1
Bovine Red Water (Bacillary)—1
Botulism in Swine—1
Tetanus—1
Ringworm in Cattle—1
Immunity in Protozoan Diseases—1

Protozoan Infections, various—1
Pathogenicity of Cattle Trypanosomes for Horses—1
Surra—2
Trypanosomiasis, general—3
Blackhead in Turkeys—1
Rhinosporidium seeberi—1
Fowl Coccidiosis—2
Ovine Coccidiosis—1
Bovine Coccidiosis—1
Piroplasmosis—1
Theileriasis—1
Anaplasmosis—1
Leptospiral Jaundice—1
Contagious Bovine Pleuro-Pneumonia—4
Foot and Mouth Disease—4
Rinderpest—3
Swine Fever—4
Swine Influenza—1
Borna Disease—1
Equine Encephalomyelitis—2
Rabies—4
Pseudorabies—1
Blue Tongue—1
Nairobi Sheep Disease—1
Fowl Plague—1
Fowl Pox—1
Flocculation Test for Pox—1
Sheep Pox—1
Sheep Blowflies—1
Warble Flies—2
Tick Eradication—1
West African Ticks—1
Sheep Scab—3
Demodectic Mange—2
Helminthiasis and Nutrition—1
Cysticercosis—1
Nematodes of Animals—1
Ascaris suilla—1
Microfilaria in Horses—2
Animal Diseases Transmissible to Man—1
Livestock Diseases in Jamaica—1
Pig Diseases—1
Diseases of Nutria—1
Books on Pig Diseases—1
Diseases in Silver Foxes—2
Rust Soot in Pigs—1
Rusty Fur in Silver Foxes—1
Sewage Poisoning—3
Calf Scour—3
Salivary Fistula in Dogs—1
Entero-Proventiculitis in Fowls—1
Equine Tooth Diseases—1
Pneumonia in Calves—1
Respiratory Diseases in Sheep—2
Pleuro-Pneumonia in Goats—1
Rhinitis in Pigs—1
Fowl Paralysis—2
Blindness in Calves—1
Periodic Ophthalmia—1
Kumri—1
Swing Back in Lambs—2
Infectious Sterility—1
Sterility in Mares—2
Bovine Sterility of Dietetic Origin—1
Mastitis in Ewes—1
Canine Abortion—1
Hæmoglobinuria in Cows—2
Granular Vaginitis—3
Abortion in Ewes—1
Cystic Mole in Animals—1
Blood Changes in Animal Diseases—1
Anæmia in Pigs—1
Ectopia Cordis in Calves—1
Jaundice in Sheep—1
Melanosis in Sheeps' Liver—1
Chronic Hæmaturia of Cattle—1
Porphyrinuria—1
Photosensitization—2
Osteodystrophia Fibrosa—1
Lambing Sickness—1
Cannibalism in Pigs—1
Trembles in Swine—1
Foot Rot in Sheep—1
Heel Bud in Horses—1
Kurloff Bodies—1
Rat Control—2
Tubercle Infection in Dried Milk—1
Milk Agglutination Tests for Contagious Abortion—2
Acridine Dyes in Veterinary Medicine—2
Value of Spleen Extract—1
Derris as a Fly Repellent—1
Pine Oil in Sheep Dips—1
Treatment of Mastitis—1
Acorn Poisoning—2
Bracken Poisoning—1
Cassava Poisoning—2
Castor Seed Poisoning—1
Corn Cockle Poisoning—1
Doping of Horses—1
Ergot Poisoning—2
Horse Radish Poisoning—1
Effect of Iodine on Animals—1
Depilatory Effect of Leucæna glauca—1
Linseed Poisoning—1
Toxicity of Perilla Seeds—1
Protein Poisoning in Poultry—1

Sorghum Poisoning—1
Iodine in Poultry Nutrition—1
Growth of Tail Switch in Cows—1
Gland Grafting—1
Blood Circulation in Cattle—1
Bovine Saliva—1
Guinea Pig Spleen—1
Danger to Cows of Oily Canal Water—1
Artificial Insemination—1
Phosphorus in Horse Blood—1
Milk Loss after Tuberculin Test—1
Hæmatology of Ostrich—1
Blood Sugar of Cattle—1
Blood Sedimentation in Cattle—1
Rhinolaryngoscopy—2
Technique of Obtaining C.S.F. from Cattle—1
Electrical Stunning—1
Veterinary Research Institutes—1
Veterinary Research in Africa—1
Effect of High Frequency Waves on Bacteria—1
Bleaching Powder for Soil Disinfection—1
Construction of Piggeries—1
Slaughter by-products—1
Electrical Cattle Goads—1
Wool Shedding by Drug Treatment—1
Serological Identification of Meat—1
Blood Groups in Domestic Animals—3

THE NUMBER OF REFERENCES RELATING TO CERTAIN SUBJECTS THAT HAVE APPEARED ANNUALLY IN INDEX VETERINARIUS

1–50 refs.	50–100 refs.	100–250 refs.	250–500 refs.	500–1000 refs.
Bacillary white diarrhœa of chickens. Glanders. Johne's disease. Anaplasmosis. Aujeszky's disease. Mange. Sterility. Swine anæmia. Fowl paralysis. Public health [other than meat and milk inspection]. Paralytic diseases [except those caused by viruses].	Anthrax. Salmonella infections [other than fowl typhoid and bacillary white diarrhœa] Diseases of the newborn. Tuberculin tests. Food poisoning of human beings by animal products. Equine infectious anæmia. Equine encephalomyelitis. Swine fever. Rinderpest. Piroplasmosis.	Bovine mastitis. Anaerobic infections. Trypanosomiasis. Foot and mouth disease. Poisoning due to both minerals and plants. Reports of departments and institutes.	Bovine contagious abortion. Therapeutics.	Tuberculosis.

[51 different virus diseases were dealt with in 1935.]

APPENDIX V

IMPERIAL BUREAU OF ANIMAL NUTRITION REPORT FOR 1935–36

An attempt is here made to give a general impression of the work being undertaken by the Imperial Bureau of Animal Nutrition at Aberdeen. Although this report chiefly refers to activities in the year ending 31st March, 1936, occasional mention is made of earlier happenings in order to preserve continuity and to ensure that those who may be unfamiliar with the scope and aims of the Bureau may read more intelligibly and consequently with greater profit.

Prefatory mention must be made of the unprecedented activity witnessed during the past decade among investigators in the field of nutritional science in all parts of the world. The whole work of the Bureau has been coloured by this fact. Whereas a few years ago the annual output of papers on nutrition could be counted in hundreds, they number several thousands to-day. As a result of this expansion, the Bureau has been obliged to scrutinise and abstract an ever-growing number of scientific periodicals, a circumstance which is reflected in the increasing size and comprehensiveness of Bureau publications. The effort is, however, amply repaid by the encouragement of biochemists, physiologists, practical agriculturists, veterinarians, clinicians, medical officers, social workers and commercial firms whose work necessitates their being supplied with up-to-date information on the progress of nutritional science, both in the sphere of academic research and in its application to animal husbandry and human health.

NUTRITION ABSTRACTS AND REVIEWS

By far the most important feature of Bureau work is the quarterly publication of abstracts and reviews. During the year under review the Bureau has scrutinised upwards of 550 periodicals, and with the aid of a competent panel of abstractors, has continued the regular issue of abstracts of all the most important nutritional papers appearing in the world's scientific, agricultural and medical literature. Volume 5 of " Nutrition Abstracts and Reviews " which was issued during the year 1935/36, contained 5 review articles, 4,762 abstracts and 935 references listed by title only, a total of 5,702 entries. As year succeeds year, there has been a steady increase in the number of papers dealt with; the number of entries in Volume 5 exceeds that in Volume 1 (issued 1931/32) by over 40 per cent.

The titles of papers, journal references, and the information contained in the abstracts are carefully verified before being passed for press, and a point on which great stress is laid is the completeness of the subject index issued to each volume. The index to Volume 5 is at present in preparation, but the number of entries will considerably exceed that for Volume 4, which contained no less than 10,300 entries. That the Journal is of recognised utility is evidenced by the gratifying increase in the number of regular subscribers. In 1931/32 the mailing list contained 577 names; in the spring of 1936 the Journal was sent to 975 addresses in all parts of the world.

TECHNICAL COMMUNICATIONS

In addition to publishing " Nutrition Abstracts and Reviews," the Bureau issues from time to time Technical Communications on special aspects of nutrition. The subjects treated in these are selected on account of their general importance or, in the case of new developments, on account of the current interest being evinced in them. For instance, in 1932 considerable interest was taken in a new Finnish technique for the preparation of grass in the form of silage. As the relative literature was scattered and mostly in foreign languages, a technical communication on *A.I.V. Silage* summarising the existing information on the process was published for the

benefit of numerous enquirers. Such was the demand for copies that the first edition of 500 copies was rapidly exhausted and a second edition of 750 copies had to be printed.

The communication summarising *Recent Research on Forage Crop Cultivation, Fodder Conservation and Utilisation,* prepared in collaboration with the Bureau of Plant Genetics at Aberystwyth, was also designed to meet the needs of specialists in that field. Of more general interest were the communications issued on *Nutrition in Relation to Reproduction with Special Reference to Sterility in Farm Animals* and, more recently, one dealing with *Recent Research in Poultry Nutrition,* for copies of both of which there has been a considerable demand. In every case these communications are supplemented with full bibliographies. The communications mentioned were all published prior to the year under review. In the interim, however, the Bureau has not been idle in this respect, and although the series was not added to in 1935/36, several technical communications have been in preparation one or two of which are almost ready for publication. It may be of interest to mention these.

Owing to the gradual realisation of the fact that the effective performance of both animals and human beings may be seriously limited on account of lowered resistance to disease, resulting from faulty rationing and diet, it was felt desirable to collect and summarise all the information appearing on this for the guidance of those engaged in verifying and extending our knowledge concerning this aspect of nutrition. Accordingly, a series of three inter-related communications is expected to appear in the early Autumn of 1936 under the following titles: (1) *Nutrition in Relation to Disease; Academic Research Work and Laboratory Investigation;* (2) *Nutrition in Relation to Disease in Human Beings;* (3) *Nutrition in Relation to Disease in Domestic Animals and Farm Stock.* Of this series, No. 1 is in preparation and Nos. 2 and 3 have actually been written and are at present being subjected to editing and emendation.

At the request of the Wheat Advisory Commission the Bureau undertook during the year to write a review on the importance of wheat as a food for man. This proved a task of absorbing interest. A chapter on the human consumption of cereals in early times and the ascendancy of wheat as the principal bread grain, was followed by one on the nutritive value of wheat in comparison with that of other cereals. Finally, the subject was treated from the point of view of consumption in relation to individual and public health, special reference being made to beri-beri, scurvy, pellagra, toxins in cereals, whole-meal *versus* white bread, and the effect of wheat consumption on the health and physique of the peoples of India. The finished document is at present in the hands of the Wheat Advisory Committee, but it is hoped will be released at an early date for publication as one of the Bureau's series of Technical Communications bearing the title "*Wheat: Pre-Eminence as a Cereal Food; Nutritive Value; Relation to Health and Disease.*"

For the past few years the Bureau has by degrees been collecting and indexing data on the chemical composition of foodstuffs of all types and from all sources. When, towards the end of 1935, the International Institute of African Languages and Cultures approached the Bureau for a copy of all the recorded analytical figures giving the *composition of African foodstuffs,* the Bureau agreed to accelerate somewhat the usual machinery by which such data are collected, and to concentrate specially on African foodstuffs. The result has been the compilation of what is thought to be a complete set of figures on African native foods. Over 450 different foodstuffs are dealt with and consideration is at present being given to the most suitable and economical method of arranging the enormous number of figures in print as a Technical Communication. The data will be of undoubted value to a much larger circle of workers than those for whom they were originally collected.

This Bureau receives frequent enquiries from over-seas workers for detailed information on the ordinary *chemical methods used in the analysis of biological material* (foodstuffs, bloods, and the like). So frequent have these enquiries become in recent months, that the Bureau has decided to co-operate with Mr. W. Godden, Head of the Biochemical Department of the Rowett Research Institute, in the publication of a Technical Communication in which all these methods will be collected together and described in detail. Experience leads us to believe that such a communication would be of great help to the increasing number of workers throughout the Empire who are engaged in the study of nutritional problems. Official Correspondents in the principal Empire countries were consulted, each being asked to recommend a chemist or chemists in his country who would co-operate with us in the proposed compilation. In every case the

replies have been wholly satisfactory and encouraging, and the greater part of the material intended for issue in this communication has already been prepared and agreed upon by all the experts approached. The publication will appear with the authoritative imprimatur of Empire chemists of recognised repute and will represent their collective experience in the use of the selected analytical methods.

A further piece of work contemplated is the publication of a second edition of the "*Index of Nutrition*," first published by this Bureau in 1931. This will give particulars regarding all nutritional research in progress throughout the Empire. Forty-three Empire countries have been circulated asking for their opinion on the proposal. Twenty-seven replies have so far been received, all strongly supporting the suggestion and expressing the opinion that the summary should prove of great value to research workers in the Dominions and Colonies.

SPECIAL ENQUIRIES

On looking over our files for the year covered by this report, we find that of the many enquiries for information received, 63 have been marked as "special." This means that the preparation of the reply entailed more than the easy quotation of some readily accessible reference. Indeed, these special enquiries in most cases call for a carefully ordered search through appropriate literature. Enquirers are finally provided with an explanatory letter briefly reviewing the existing information on the matter about which they have written, together with a list of literature references to the best papers on the subject. From the Bureau's point of view the preparation of replies to special enquiries from over-seas countries and elsewhere is exceedingly interesting and instructive work. We have been able to build up a series of valuable files containing information on a variety of subjects. These are, in fact, technical communications in embryo form. It is manifestly impossible to refer in detail to all the enquiries received during the year, but the following notes taken at random from our 1935–36 records will give some idea of the nature of enquiries dealt with and their country of origin.

To the Cawthron Institute in *New Zealand* we wrote on the question of boron in animal nutrition; agricultural officials in *Canada* are frequent enquirers, the most recent information sent being analytical data pertaining to certain proprietary feeding stuffs for pigs; with the Veterinary and Agricultural Department of *British Somaliland* we are at present in correspondence about the feeding of camels; the authorities there have agreed to carry out certain experiments suggested by us, and we have recommended and arranged the despatch of a mineral mixture to be used in these trials. *Australia* consulted us on the Spangenberg process for sprouting maize for fodder; the Medical Department in *Sierra Leone* sought information on the composition of rice, and the Medical authorities in *Iraq* on the composition and vitamin content of dates. The Agricultural Department of *Jamaica* were sent a comprehensive account of the nutritive value of fish, while detailed information on cotton seed as a cattle and human food was sent in answer to an enquiry from the Medical Inspectorate at Kadugli in the *Sudan*.

Coming nearer home, one of the most extensive surveys completed during the year was that for the *Fruit and Vegetable Preservation Research Station* at Camden, Gloucestershire, on the effect of canning on the nutritive value of foodstuffs. For the *Ministry of Agriculture and Fisheries*, London, we supplied information on the composition and feeding value of meals made from vegetable ivory; and for the *Long Ashton Research Station* we provided references on the preparation of apple silage and the nutritive value of the resultant product. The *Royal Dick Veterinary College* in Edinburgh enquired upon the mineral composition of oats, and received a detailed reply. Information on the present state of our knowledge on osteodystrophic conditions in horses was prepared for the *Agricultural Research Council*, while the Agricultural Chemistry Department of *Queen's University, Belfast*, was supplied with the best references on the protein and non-protein nitrogen content of bovine blood. The *Imperial Institute*, South Kensington, frequently refer to us, and during the year we assisted them by looking out information on feeding cakes made from illipe nuts, and on the use of wheat germ oil in the feeding of livestock.

Occasionally we undertake to supply bibliographies and information to commercial firms on a payment basis. For instance, a detailed statement was sent to British Cultivations Ltd. on

the nutritive value of germinated cereals; and Rhokana Ltd. were provided with an account of the biological *rôle* of cobalt with special reference to its probable influence in the cure of bush-sickness and other iron deficiency diseases.

OTHER SERVICES RENDERED TO OVERSEAS WORKERS

Mention has already been made of the Bureau's part in arranging for the despatch to *British Somaliland* of a mineral mixture for feeding experiments. Services similar to these have on occasion been rendered in previous years. One recalls an enquiry from the Department of Lands and Forests in *Palestine* which resulted in arrangements being made for the export to that country of a number of Scotch blackfaced sheep for experimental purposes. Requests are not infrequently received for assistance in having chemical analyses carried out on samples of food-stuffs, etc., sent home from abroad. In recent months arrangements have been made for the analysis of edible earths for the Department of Agriculture, *North Borneo :* of samples of rice for the Medical Department of *Sierra Leone* and of carob beans for the Department of Agriculture in *Palestine*. Facilities of the kind mentioned can only be obtained with the goodwill of the Rowett Research Institute to which the Bureau is attached. The Bureau is fortunate in being associated with Institute workers who are so ready to help, and this opportunity is taken of thanking them for their willing co-operation.

LIBRARY AND TRANSLATION FACILITIES

Both for its own convenience and for the benefit of all concerned, the Bureau administers the Reid Library of the Rowett Research Institute. This is considered to be the most complete library of nutritional literature in this country. Although the lending of books is limited to borrowers within the United Kingdom, occasional exceptions to this rule have been allowed. The 1935/36 records show that books have been sent on loan to the Animal Husbandry Department in *Tanganyika*, and also to *Canada*. Numerous requests are received for reprints of publications and for extended abstracts or full translations of papers appearing in " Nutrition Abstracts and Reviews." Such requests are fulfilled as expeditiously as possible.

VISITS

The Bureau is encouraged in its work by frequent visits from over-seas workers. Among others who visited the Bureau during the year under review were: Colonel A. Olver, C.B., C.M.G., Animal Husbandry Expert, I.C.A.R., Simla, India; Dr. J. M. Swaine, Director of Agricultural Research, Ottawa, Canada; Sir Edward Harding, Dominions Office, London; J. D. Coles, Esq., The Division of Veterinary Services, Union Department of Agriculture, South Africa; Dr. A. Carruthers, Peiping Union Medical College, Peiping, China; Dr. W. F. Hampton, Department of Natural Resources, St. John's, Newfoundland; Mr. C. C. Kuchel, C.S.I.R., Adelaide, South Australia.

DETAILS OF NUTRITION ABSTRACTS AND REVIEWS

	No. of pages	*No. of review articles*	*No. of abstracts*	*No. noted by title only*
Vol. I	876	7	3,034	265
„ II	954	9	3,412	330
„ III	1,270	6	5,106	758
„ IV	1,014	6	4,205	697
„ V	1,237	5	4,762	935

APPENDIX VI

IMPERIAL BUREAU OF ANIMAL GENETICS REPORT FOR 1935-36.

LIBRARY

The library and reprint collection are steadily growing. The Bureau is indebted to the Institute of Animal Genetics for a gift of 23 volumes of agricultural journals; in addition, 78 volumes of various periodicals have been purchased from the Institute at a reduced price; these include all the early volumes of Zeitschrift für Züchtung B, so that the Bureau now possesses a complete set of that periodical. Several new exchanges have been established and quite a number of offers of exchange have been declined, as it is considered that in a small library like that of the Bureau there is room only for journals that are either specifically concerned with subjects of interest to the Bureau, or else are not available elsewhere. The total number of complete volumes on April 1st, 1936, was 807, of reprints 1,609, and of current periodicals 50. Owing to the growth of the library, it is anticipated that it will soon be necessary to extend the present accommodation, especially as the Bureau houses the library of the Institute of Animal Genetics.

INDEX

The card-index of authors and subjects is growing at a rate of some 2,000 references (8,000–10,000 cards) a year; the total number of cards up to date is estimated at about 54,000. Owing to the cumbrousness of the Decimal Classification and the fact that Miss Cytovich is able to devote only a portion of her time to library work, it is possible to deal only with current literature and consequently many useful references prior to the date of the establishment of the Bureau have not yet been incorporated.

PUBLICATIONS

In spite of the fact that no attempt has been made at any extensive advertising, the circulation of *Animal Breeding Abstracts* is increasing. The number of subscribers to the current volume reached on April 1st, 1936, was six months ahead of the previous year. A total of 167 volumes of the journal has been sold, as compared with 128 volumes during the previous year and 100 volumes in 1932. The number of journals searched and of papers abstracted is still increasing and, should additional staff be available, this side of the Bureau could be extended to general advantage. Owing to the steady demand for the *Technique of Artificial Insemination*, 200 additional copies have been reprinted at a very small cost. It is anticipated that a new issue of this publication may be required, either in the form of a supplement or as a revised edition. The total income from sales amounted to £160 5*s*. 2½*d*.

VISITORS

These included Sir Edward and Lady Harding, Dr. J. M. Swaine, Canada; Colonel Olver, C.B., C.M.G., India; Captain H. V. M. Metivier, O.B.E., Trinidad; Professor R. Prawochenski, Poland; Professor Per Tuff, Norway; Mr. J. W. Howe, Hope Farm, Jamaica, and other visitors from Gold Coast, Brazil, Denmark, Egypt, Northern Rhodesia, New Zealand, Australia, the Irish Free State, and the U.S.A.

ENQUIRIES

A number of enquiries from various parts of the world were received and dealt with as far as possible. It is a pleasure to acknowledge the helpful co-operation of Mr. A. D. Buchanan

Smith, while the transfer of Professor Wm. C. Miller from the staff of the Institute of Animal Genetics to London has been a great loss to the Bureau.

DEVELOPMENT

The enquiries received by the Bureau may be divided into two categories. Firstly, those from research workers who ask for specific information on some strictly delimited problem, and involve a search of literature, loan of journals or reprints, or abstracting or translation. They are not numerous and can usually be dealt with adequately. Enquiries of the second type come from agricultural and veterinary officers in the Empire, who ask for advice and criticism of investigations planned or in progress, opinion concerning the adoption of a policy, etc. These are more numerous and a great deal more difficult to answer. In this connection the lack on the Bureau staff of a person qualified to give a considered opinion is felt very acutely. A typical enquiry, for example, asks " what attitude you take towards breeding " animals suffering from a certain affection, " as well as your opinion on the direct hereditary nature or otherwise of this disease." This side of the Bureau activity merits a great deal more of attention than it is receiving at present when the time of the staff is occupied almost exclusively with the preparation and issue of the abstracting journal: it should be remembered that this Bureau is the only one whose staff is now actually smaller than it was at the time of its establishment. It may be added that the small Quarterly Bulletin originally issued by the Bureau undoubtedly served a useful purpose not entirely met by *Animal Breeding Abstracts* and it might be desirable to revive it, perhaps in the form of a Supplement, to include interesting points from correspondence or other unpublished sources, short notices of current events, and similar information.

The application of the science of genetics to the breeding of the larger domesticated animals is still in its infancy. In this country particularly, the man who is engaged in this work is rarely concerned solely with animal breeding, his interest in this subject being usually secondary to veterinary science or general agriculture. The Bureau could do a great deal of useful work if it tried to foster an interest in animal genetics, solicited enquiries rather than awaited them, and was able to act in an advisory capacity. It is hoped that the Bureau staff will be strengthened so that this line of activity can be extended.

DETAILS OF ANIMAL BREEDING ABSTRACTS

		No. of pages.	*No. of abstracts.*
Vol. I.	1933	327	1,375
„ II.	1934	406	1,647
„ III.	1935	424	1,726

APPENDIX VII

IMPERIAL BUREAU OF PLANT GENETICS (FOR CROPS OTHER THAN HERBAGE)

REPORT FOR 1935–36

The need for some clearing house system to deal with the quantities of agricultural literature published every year is now much more acute than even in 1929 when the bureaux began to function. For instance, the library of the School of Agriculture at Cambridge receives every year some six hundred periodical publications and nearly a thousand non-periodical publications such as bulletins, reports, etc., which come from 378 different places, not to mention the large number of books which are always coming in.

According to the Editor of Chronica Botanica there are at present between 60,000 and 70,000 botanists in the world and about 1,000 botanical periodicals. The United States Department of Agriculture, however, in a recent report states that 3,034 journals are regularly used in making lists of current literature on botanical sciences.

It is estimated that articles on Plant Breeding alone (excluding Genetics and Cytology) appearing in periodicals published in 1930 covered 4,025 pages and it has been calculated that a plant breeder would have to read eleven printed pages a day in order merely to keep up with the papers in his own restricted subject. In 1934 the number of articles appearing was greater by 915 (representing an increase of 12·7 per cent.) than in 1930 and it seems to be still increasing. Yet nowadays no research worker can afford to confine his reading to his own particular subject, for the sciences are impinging one upon the other to an ever greater degree. A plant breeder to-day finds it is almost more essential to keep in touch with recent developments in genetics than in plant breeding proper, and the dividing line between genetics and cytology has become so far obliterated that the two subjects have come to be regarded as the same science. Plant genetics has of late also become very much linked up with plant physiology and will inevitably become more so in the not far distant future. The plight of the agricultural research worker is further aggravated by the difficulty of language. Before the War scientific papers were usually written in either English, French or German, occasionally also in Italian, and scientists were legitimately expected to have at least a working knowledge of these languages. Not so to-day—a wave of nationalism has swept the world since the War and even so pacific a pursuit as agricultural research has not escaped its baleful consequences, for to-day it is not unusual to find papers of scientific importance appearing in Ukrainian, Hungarian, Portuguese, Polish, and even Lithuanian and Finnish, etc., without summaries in other languages, not to mention the enormous quantity of literature that now appears in Russian, and another group of increasing dimensions in Japanese and latterly also Chinese. There was an increase between 1930 and 1934 in the proportion of articles written in languages other than English, French and German and at the Sixth International Botanical Congress held at Amsterdam in 1935 it was calculated that at least 17·5 per cent. of the botanical literature is now inaccessible to those reading only these three languages. Twenty-four different languages were represented under this 17·5 per cent., and less than half of the papers written in them in 1934 had summaries in English, French or German.

It is clearly beyond the capacity of any one individual to make direct use of this volume of literature. Some form of co-operative effort has become essential. This bureau has been organised to make readily available to the research worker the literature on plant breeding and the genetics of economic plants.

The first stage in such service is to collect and examine the scientific and Agricultural publications of the whole world. The bureau has the advantage of the services of the library of the

School of Agriculture, one of the best equipped agricultural libraries in the United Kingdom, which, by the indefatigable efforts of the Sub-Librarian, is becoming constantly more complete. All the journals received in the Library, involving over 3,000 separate parts per annum, are examined, in addition to which some 150 or more journals are examined regularly in outlying libraries by the Bureau staff and occasional articles are found in still other journals through the agency of reference works, bibliographies, etc. Many articles are also obtained in the form of reprints, sent by the authors either voluntarily or on request from the Bureau. All relevant articles are noted and included in a card catalogue which is permanently available for consultation by the Bureau staff and Empire workers. The second stage is the dissemination of this information to the workers overseas with the least possible loss of time. Experience has shown that lists of titles are of comparatively little use—the title is often ambiguous or misleading; most provincial and overseas libraries, however excellent, are without a considerable number of such highly technical publications, and last but not least, even when access can be had to the original this is not infrequently unintelligible to the searcher on account of the language in which it is written.

A few months' experience shewed that the most useful service was the supply of English abstracts of all the relevant papers. In 1930 a quarterly abstract journal, " Plant Breeding Abstracts ", bringing together all the papers of value on the breeding, genetics and cytology of crop plants was started. The abstracts are in English and special care has been taken to give particularly full résumés of the papers written in Russian and in the more obscure languages. The bureau has members on its staff who can deal with all the main European languages, including German, Dutch, Swedish, Norwegian, Danish, Russian, Spanish, French, Italian, Portuguese and Rumanian. Bureau correspondents do Estonian, Latvian, Greek, Chinese and Japanese. " Plant Breeding Abstracts " has become the standard work of its kind in its subject. References to it are frequently seen in Empire and foreign journals and its abstracts have been reproduced in specialist publications of the most varied kind. Botanists in seventeen different foreign countries subscribe to it.

In addition to the publication of " Plant Breeding Abstracts " the bureau serves its users through correspondence, and the publication of bibliographical documents on particular subjects. The permanent record is in the form of a card catalogue, which naturally contains a great many entries not deemed of sufficient importance or general interest to be included in the abstract journal. With its aid enquiries received from workers all over the Empire and elsewhere are answered. These enquiries vary in nature; some are quite straighforward requests for information on a particular point, many consist of requests for references to the literature on a special branch of the subject that the enquirer happens to be interested in, whilst some are on more obscure points and involve a considerable amount of searching, scrutiny of the literature and often correspondence to enable them to be answered satisfactorily.

During the earlier part of the year under review some rather extensive enquiries were received and dealt with. These included enquiries from English research stations on the influence of sex on yield in asparagus and on cooking quality in potatoes, from Canada on the nature and sources of the new sweet lupins recently produced by plant breeders in Germany and Russia, from New Zealand on growing mixed populations of different strains of the same cereal and from Australia on the new phenol test for distinguishing wheat varieties; a request from Kenya to arrange for the carrying out of certain wheat crosses in this country, an enquiry from Nigeria regarding the contents of a German article on oil palm pollination, involving the preparation of an abridged translation of the paper, a request from Indore (India) to obtain a copy of certain parliamentary papers relating to Indian Agriculture, a request from Nigeria for information concerning a research station in the Belgian Congo, which information was obtained after long correspondence in French with various departments in Brussels and the Congo; a request for information from an unusual journal on wild potatoes in Africa, and enquiries regarding a new electrolytic method of determining the degree of degeneration in potato tubers, the literature on mitogenetic rays, and on all the research stations in the world dealing with potato breeding.

Some of the enquiries received and dealt with since the beginning of 1936 have concerned wheat varieties suitable for growing in the North West Frontier of India, in Peru and in other

countries, queries as to the average wheat yields in Italy and the cultivation of *Triticum Spelta* in England. An enquiry on the reasons for loss of quality in oats on storing has been answered in conjunction with the Low Temperature Research Station and a review of the work on cereal breeding in the British Isles has been prepared for the International Congress of Plant Breeders, to be held in Holland in June, at the request of the Secretary. Various queries relating to the problem of vernalization have been answered and lists of references have been supplied to correspondents on a number of varied topics, including cotton genetics, potato varieties for northern latitudes, lodging in cereals, literature on chicory breeding, the rice species *Oryza subulata*, the species of the *Capparidaceae* available in the United Kingdom, literature on the breeding of vegetables, the origin of the cultivated rices, cooking quality in peas, oat varieties resistant to rust, and the new huskless oat and its prospects under cultivation. It is interesting to note that many of these enquiries are on subjects rather distantly related to plant breeding. This is perhaps natural, since most of the readers' doubts on problems directly concerning plant breeding and genetics can be solved by reference to the pages of Plant Breeding Abstracts and the other bureau publications.

Another service offered by the bureau is the supply of translations or extended abstracts of foreign papers of special importance. By means of correspondence and personal contact the bureau endeavours to keep in touch with its users and issue these extended abstracts in accordance with the general needs of the majority of the workers in different parts of the Empire. Certain research workers in the Empire have found this branch of the bureau's activity very helpful.

The bureau also informs correspondents in this way of important developments or publications. When translations or abridged summaries are made in addition to the abstract published in Plant Breeding Abstracts the fact is indicated in Plant Breeding Abstracts so that the translation is available to all readers who apply. Scarcely a week goes by without receiving a number of requests for the loan of these translations and special loan slips have been printed to keep trace of them. Lists of the translations available in this way are circulated every year to correspondents, and official letters have been received from India and other countries intimating that this service is highly valued.

Frequent requests are also received from correspondents for translation of articles in which they are particularly interested. Whenever possible these requests are complied with, though the preparation of full translations is a time-absorbing task and in cases where the work is not strictly on the subject of plant breeding it has sometimes been necessary to refuse or to offer to make an abridged translation or supply a translation of the summary. Among the works translated on special request during the last year the following may be mentioned : a 10-page article on Xenia for the Nigerian Department of Agriculture, an article of 10 pages on breeding potatoes for cold resistance for the Director of the Potato Virus Research Station, the legends and diagram headings to a Russian bulletin on potatoes for the Superintendent of the Experimental Station for New Brunswick, Canada, the translation of various German technical terms for a correspondent in Norfolk, the summary of a Russian paper on the effect of irradiation of cotton plants for the Cotton Specialist, Madras, an article on " The problem of the vegetative period in breeding " from the Russian for Dr. E. S. Beaven, two articles on leaf-curl in tobacco from Dutch for Dr. B. P. Pal, an extract from a Russian work on the morphology and classification of rice, a bulletin of 107 pages on the " Genetic nature of the colouring of potato tubers " from the Russian, for the Potato Virus Research Station, a forty page Russian article on the method of determining oil content of a seed in breeding work and a section of a work on chromosome morphology from the Russian.

One of the most frequent enquiries received from correspondents takes the form of a request for supplies of seed, usually of some special type referred to in the bureau publications or of special interest for breeding or from some other point of view. Every effort is made to meet these demands ; this can sometimes be done from the supplies carried by the Plant Breeding Institute and other members of the University staff, whose courtesy in this respect has considerably facilitated the work of the bureau. In other cases it has been possible to put the correspondent in touch with the best source of supply, as in the case of a correspondent in

Canada who desired a specimen of a Russian oat variety referred to in the latest number of Plant Breeding Abstracts. In other cases the Bureau has given active assistance in obtaining the material desired by the correspondent; in this way specimens of certain swede varieties resistant to club-root were obtained from a correspondent in Sweden and supplied to enquirers both in Canada and in Devonshire, at both of which stations tests are now being carried out on the Swedish strains. Though not the prime function of the bureau the importance of assistance in obtaining specimens and collections of breeding material is illustrated by the frequency with which such requests are received from breeders all over the Empire. One of the best illustrations is the case of the South American potato species which are arousing interest in all potato growing countries in the Empire. At the special request of the Imperial Council of Agricultural Research in India during the Deputy Director's visit to Delhi, the bureau approached agricultural departments both in Germany and Sweden in the attempt to obtain the material that these countries had collected by the expeditions they had sent to South America immediately the result of the Russian expeditions became known. A small amount of the South American material was obtained from the Kaiser Wilhelm Institut für Züchtungsforschung in Germany and after multiplication on the University Farm supplies of it have in 1936 been sent to India, New Zealand, Sydney (New South Wales), Victoria, Canada, North Ireland and South Africa. The importance of the material and the interest evinced in it in so many different countries would warrant a very much more elaborate treatment than has actually been possible; indeed the Indian department requested that an attempt should be made to organise an expedition co-operatively between the different Empire countries to collect the potato material in South America. The definition of the field of activities of the bureau, however, made it impossible to do more than has been done, and the maintenance and multiplication of the small amount of material obtained from Germany was only made possible by the courtesy of the University Farm and the Potato Virus Research Institute.

The instance of the South American potatoes illustrates the importance in modern breeding work of an organised system of collection and exchange of initial material and this is a topic that is repeatedly mentioned, both in correspondence and in person, by Empire breeders as a line in which the bureau activities could very profitably be extended. The procuring of the potato material was the direct outcome of the Deputy Director's tour to India and also illustrates the extreme value of such opportunities for personal contact between the bureau officers and those actively engaged in plant breeding work in the Empire.

In the matter of specialised publications the bureau has been active. The appointment of an additional scientific assistant has made it possible to complete a number of projects that had been planned some time ago but were held up owing to shortage of staff. The second Supplement to Plant Breeding Abstracts was published in April, 1936. This is a 63 page volume giving a full survey of the breeding work in progress in the different countries in the British Empire, based on the Annual Reports received from the respective stations and covering the period 1932 to 1935 inclusive. The subject matter is classified according to crop and sub-divided according to countries, so that it affords a valuable reference work, providing as it does, a sort of bird's-eye-view of progress in all different crops in all the Empire countries. A similar volume dealing with countries outside the British Empire is now in preparation.

A new bulletin on Vernalization has been prepared in collaboration with the Imperial Bureau of Plant Genetics (Herbage Crops), Aberystwyth, and was published in December, 1935. The original Vernalization bulletin in 1933 made this important new branch of agricultural research widely known. All the information previously published on the subject had been written in Russian. Interest was evoked in almost every country in the world and the edition was soon out of print. The subject developed with leaps and bounds, both in Russia and in other countries. Mere revision of the earlier bulletin became impracticable. In response to numerous requests received both at Aberystwyth and by this bureau a completely new publication was prepared by the two bureaux. All the Soviet literature which had appeared on the subject since the issue of the original bulletin was examined and all the papers which presented anything original, some 110 in all, were abstracted; these abstracts form the basis of the new bulletin. The other, more general, Russian papers were also listed. Abstracts were also given

of all the original papers appearing on vernalization in other countries and of a number of communications received by the Bureaux from correspondents in Empire countries, giving the results of work in progress. The bulletin deals with the data from both the practical and theoretical aspects and also presents the opinions of a number of investigators holding views which are in many respects contradictory to those of Lysenko. It thus constitutes the most comprehensive, authoritative and impartial review of the subject yet published.

The usefulness of the earlier bulletin was publicly acknowledged at the Sixth International Botanical Congress at Amsterdam in September, 1935, and the information that an entirely new and up-to-date bulletin was under preparation was welcomed by the whole meeting.

Another publication which had been held up owing to shortage of staff and has now been duly completed is the Cumulative Index to Volumes I to V of Plant Breeding Abstracts. In this Index all entries in the first five volumes of Plant Breeding Abstracts are fully classified, both according to authors and according to subjects. The subject index is arranged according to the Universal Decimal Classification, with an alphabetical key to the subjects, and in fact forms a miniature reproduction of the subject card catalogue in the Bureau. As such it is in constant use at the bureau. The value of Plant Breeding Abstracts as a reference work is very materially increased by these cumulative indexes and many readers have remarked how valuable they find them. This cumulative index was the subject of a discussion which the Deputy Director was invited to open at the general meeting of the British Society for International Bibliography. The preparation of the index was described and led to a lively discussion by the members assembled as to the relative merits of different forms of index and of classification. Much benefit can be obtained by discussion of this nature among experts on bibliographical matters.

The bureau has been instrumental in having some additions and alterations made to the Universal Decimal Classification and has been asked to be responsible for the entire agricultural section in the English edition of the classification which is at present in preparation and the first section of which has just appeared.

The enlargement of the bureau staff has made possible further progress in the preparation of bibliographical monographs. The last of these to be issued was on " Interspecific and Intergeneric Hybridisation in Relation to Plant-Breeding ". Many correspondents have stated that they regard this bringing together and briefly surveying the literature on important fields of modern development as one of the most useful services that the bureau performs. Another monograph nearing completion is on " Experimental production of Haploidy and Polyploidy ". The monograph is the direct outcome of an enquiry received from one of the bureau's correspondents. The theme seemed to be too large to warrant an investigation for a single enquirer and as it represents another important line of recent development it was decided to deal with it comprehensively and make it the subject of a bibliographical monograph.

In addition to these special publications the preparation of Plant Breeding Abstracts is a much heavier task than in the first few years of the bureau's activity. The number of pages has more than doubled from the first to the fifth volume and the number of entries has risen from 606 to 1,220. Volume 6 promises to be somewhat larger still in spite of the efforts to reduce its size by cutting out certain topics such as pollination studies, variety trials and others of regional rather than of a general interest. This increase in the number of papers abstracted is the result of the recent great increase in the published literature. Several new journals devoted to plant breeding have been started since the bureau began working, and both plant breeding and plant genetics have become the subject of serious attention and research in a number of countries, such as China, Czechoslovakia, Spain and Portugal, which were formerly unconcerned with these subjects. These factors, coupled with a continuous extension of the field of material examined by the bureau, have increased the number of papers to be abstracted. As the experience of the first few years shewed, the bureau caters for two distinct needs, those of the strictly practical plant breeder on the one hand, and on the other those of the scientist occupied with highly specialised and recondite problems in the genetics and cytology of economic plant species such as cotton, bananas, maize and others. Both these fields are equally represented in Plant Breeding Abstracts. The section on field experimentation and statistics, one of the most important to the practical breeder, has much extended, and an entirely new branch of plant breeding, the

genetics of forest trees, has come into being in the last few years. The number of books presented and reviewed in Plant Breeding Abstracts also rose to 61 in 1935.

Contributions to other journals frequently reach a field of readers otherwise not covered by the Bureau system, and the Deputy Director has, at the invitation of the editors, written articles during the year for the Biological Reviews of the Cambridge Philosophical Society on " Genetics in its application to plant breeding ", for Scientific Agriculture and the Copenhagen Congress of the Institut International de Documentation on " The Imperial Bureau of Plant Genetics " and for the Journal of the Ministry of Agriculture on " Vernalization ". Representatives of the Bureau staff also attended the twelfth conference of the Association of Special Libraries and Information Bureaux which was held in Cambridge in September, 1935.

In addition to the activities described, there have been a number of internal developments. The clerical staff of the Bureau has been enlarged and it has thereby been made possible to complete a number of revisions in the card catalogue, many of which have been contemplated for a number of years, thus bringing the catalogue up to date and into line with the newer methods of the Bureau evolved as a result of the first five years' working experience. A number of technical improvements have also been introduced in the organisation of the routine work of the Bureau.

Authors, both Empire and foreign, of papers on plant breeding and genetics have always been encouraged to send reprints of their papers to the Bureau for review and in response large numbers of papers have been received in this way during the last year. The collection of reprints to date numbers already about three thousand items and makes an invaluable library of material for use both for reference and for loan. These reprints are frequently sent abroad to correspondents asking to see a particular paper. For many reasons the despatch of the bound volume containing the paper is impracticable and the despatch of the reprint cheap, practicable and sufficient. A valuable collection of books is being built up from copies received for review. This forms an equally valuable library for reference and loan. Over seventy of these have already been received since June, 1935. The maintenance of these collections is greatly facilitated by the co-operation of the Sub-Librarian of the University School of Agriculture, whose ready help and interest have in innumerable ways contributed to the successful functioning of the Bureau.

As usual a number of distinguished visitors have been received at the Bureau in the course of the year. It is not possible to mention all, but visitors have been received from as far afield as Malaya, Spain, Poland, Pretoria, Yugoslavia, Egypt, Germany, New Zealand, Barbados, Tasmania, Australia, Latvia, Calcutta, Ottawa, Uruguay, Madras, Cyprus, Zanzibar, China and Japan.

Great importance is attached to the maintenance of cordial relationships with scientists abroad and to the compliance as far as practicable with requests received from them; for instance that recently received from the University of Halle-Saale in Germany for the loan of three publications to which reference had been seen in Plant Breeding Abstracts.

By such and similar small services friendly relations are developed and maintained facilitating co-operation between the agricultural workers in the Empire and abroad. It can justly be said that those relations have been further developed during the year.

DETAILS OF " PLANT BREEDING ABSTRACTS "

	No. of pages.	*No. of abstracts and entries.*	*No. of Book Reviews.*
Vol. I	151	606	—
II	220	726	11
III	224	759	35
IV	358	1,127	39
V	379	1,159	61

APPENDIX VIII

IMPERIAL BUREAU OF PLANT GENETICS (HERBAGE PLANTS)

REPORT FOR 1935–36

The Herbage Bureau is associated with the Welsh Plant Breeding Station, sharing with that Station the specialist library which has been formed. This association is of great value to the staff of the bureau, as it facilitates discussion with the various research workers on any points that may arise in the study of the literature or in correspondence. The bureau is of course distinct from the Station, being financed from the central funds of the Executive Council of the Imperial Agricultural Bureaux.

INDEX OF HERBAGE AND FORAGE CROP RESEARCH

The main routine work of the bureau consists in the indexing and abstracting of all papers dealing with this subject. The very extensive index which has been formed after some years of this work is available to any visiting research workers who may wish to follow up some particular problem or aspect, and to the members of the Welsh Plant Breeding Station. It is also of very considerable value in replying to questions from the Dominions and Colonies and in the preparation of bibliographies on behalf of correspondents. There is a constant demand for translations from foreign languages and for reprints from the reprint library. The most important work of the bureau staff is, however, concerned with the preparation of abstracts, reviews or other material from the current literature. These are finally published in one or other of the issues of the Herbage Publication Series.

HERBAGE ABSTRACTS

Our quarterly abstracting journal, which is now in its sixth volume, has been increasing steadily in size year by year; this has been due in part to the rapid increase in herbage literature consequent upon the greater amount of research on herbage and forage crops in all parts of the world, and in part to a progressive extension in the work of the Herbage Bureau to cover aspects indirectly connected with its original subject, which are considered to be of primary importance and for which a demand exists but is not supplied by any other bureau. This extension has been chiefly in the direction of plant physiology, a subject in which rapid advances are now being made.

HERBAGE REVIEWS

This journal was started in 1933, being the result of a suggestion made by the Secretary of the New Zealand Council for Scientific and Industrial Research, while on a visit to Aberystwyth in the previous year. Dr. E. Marsden said that we bureaux are in a unique position at the centre of everything, with all sorts of information at our disposal. What workers in the more distant Dominions required was a type of news service by which they, and more particularly those isolated from libraries, could keep up to date in herbage matters.

It is hoped that *Herbage Reviews* will do something to meet that need. The bureau notes any particular line of research of special interest and deals with it in more detail in this journal than is possible in *Herbage Abstracts*. These reviews are either made by the bureau staff or are obtained from specialists in other countries. A special effort is always made to include references to papers or research from countries where languages other than English are used. Numerous

articles have been received in German, Russian, or some other language and have been translated into English for publication in *Reviews*.

In addition to these original articles and reviews, references are made to any conferences which deal with herbage or forage matters, and to reports of research stations. The object of the editor of *Herbage Reviews* is to use to the best advantage the facilities which are available in consequence of the recognition of Aberystwyth as a centre of grassland research and of the bureau in particular as an organisation for aiding the interchange of information and material between workers in all countries.

Herbage Reviews is the only journal published in English which specializes in subjects relating to grassland and forage crop research. It is hoped to improve this journal still more, with the assistance of the corresponding editors and official correspondents of the bureau in British and foreign lands.

BULLETINS

When a subject is considered to be still more important, and unsuitable for presentation in *Herbage Reviews*, a bulletin is prepared. These are, of course, similar to the Technical Communications of the other bureaux. Seventeen bulletins have so far been published and have met with a wide demand from the grassland and botanical public. The following paragraphs will give some idea of the work done during the year and of the future bulletins which will be appearing.

For several years the Aberystwyth and Cambridge bureaux have collaborated in the study of the extensive literature dealing with the modern agro-physiological subject, vernalization. In December, 1934, the Aberystwyth bureau had produced its Bulletin 16 on " The theoretical significance of Vernalization," by Professor N. A. Maximov, the eminent Russian physiologist.

No bulletins were published during the year 1935 until the large Bulletin No. 17, " Vernalization and phasic development of plants," was published in December of that year. The preparation of this bulletin, which gives an unbiassed account of the world research, entailed a great deal of work on the part of the two bureaux. The bulletin was published in the first week of January, 1936, and met with a most gratifying reception.

Since the publication of Bulletin 17 it has been possible to give attention to the preparation of others in the series. Bulletin 18 (" Grasslands and forage crops in South Africa ") is already in the first-proof stage. It is one of several which have appeared dealing with research in the various Dominions. Bulletin No. 11 (" Technique employed in grassland research in New Zealand ") contained articles by the leading research workers in New Zealand; Bulletin 14 contained tabulated information on Australian grassland and forage crop research, together with articles on technique by Australian investigators. India has been represented by articles published from time to time in *Herbage Reviews*, while arrangements were made in 1935 with Dr. L. E. Kirk, our Canadian correspondent, for the publication in that journal of a series of articles on Canadian forage crop research. The suitability of South African research as the subject for a bulletin will therefore be obvious. Bulletin 18 will contain an article by Dr. I. B. Pole Evans, our South African correspondent, and contributions by the research workers of the Division of Plant Industry. It is also hoped to include a tabulated section indicating the problems being studied at the various research centres in South Africa. It is not expected that this bulletin will receive such a wide demand as the preceding Nos. 16 and 17, but it should provide a clear picture of South African research which may lead indirectly to a useful exchange of knowledge and material between that country and others concerned with similar problems.

Two other bulletins are still in the early stages of preparation. One will probably deal with the use of grass in erosion control, more particularly in arid lands, and will be the result of the tour of the Chief Officer to U.S.A. and Canada in May to July, 1936.

The other bulletin in preparation will deal with the production of seed of herbage and forage plants. No publication in existence deals satisfactorily with all the aspects of this most important branch of agriculture. With its official correspondents, corresponding editors and associate correspondents in all the British and the more important foreign countries, the Herbage Bureau is in a unique position for the collection of the information necessary for the production of a bulletin on this subject.

The bulletin as planned will be chiefly agronomical and will therefore be of value to a wide public, including breeders of herbage and forage crops, agronomists, seed merchants and seed growers in every country where herbage and forage crops are grown for seed. Two questionnaires have been circulated and replies are already coming in from countries with different crops and different natural conditions, such as Northern Ireland, Sweden, Latvia, Turkey, Tunis and Wisconsin, U.S.A. Recognized authorities in many lands have been asked to collaborate by writing brief articles on the technique used locally. Several articles on the scientific bases of seed production are to be obtained. When complete, this bulletin will be one of the largest published by the Herbage Bureau, but to judge from letters already received, it will certainly appeal to a wide public and should be a success. Its " timeliness " has already been commented on by one American correspondent.

These bulletins will probably complete the productions of the Aberystwyth Bureau for 1936. Other topics which deserve consideration as suitable for treatment in bulletin form may be mentioned.

(*a*) An index of research on herbage plants, forage crops and general grassland questions, similar to that presented in Bulletin No. 5 in 1931 (now out of print), would be valuable in connection with the 4th International Grassland Congress to be held in Aberystwyth in July, 1937.

(*b*) A publication dealing with the forage crops of the tropical and subtropical countries, similar to that produced by Mr. H. A. Sampson, of Kew, on the food plants of those countries, would appear to be desirable. The circulation of a questionnaire to obtain the necessary data and its subsequent preparation in bulletin form would be comparatively easy matters.

(*c*) The numerous requests received regarding the value of *Spartina Townsendii* in the reclamation of tidal marshes suggest that it might be advisable to publish a bulletin on this subject; Mr. James Bryce of the East Anglian Institute of Agriculture, Chelmsford, the authority in England on this subject, might collaborate with the bureau in its preparation.

So far the selection of suitable topics for bulletins has been almost entirely done by the bureau staff. It is to be hoped that the correspondents of the bureau will communicate with the Chief Officer if any subject deserving such treatment occurs to them.

BUREAU CORRESPONDENTS

The Herbage Bureau has correspondents in all countries where grassland or forage crop research is carried on. At its inception, official correspondents were appointed in all the British Dominions and Colonies. From time to time since that date arrangements have been made with recognized authorities in many foreign lands whereby the selected person acts as the " friend " of the bureau for his particular country. These corresponding editors receive a set of the Herbage Publication Series in return for their services. The value of this arrangement cannot be overestimated; all circulars for seed or information are sent to them and they invariably send a helpful reply. It is desired here to express the appreciation of the bureau for the valuable assistance given by these correspondents. More recently a further list of associate correspondents in other countries has been prepared, but these do not receive any publications. They are communicated with when their help is required; circulars requiring a very wide circulation are sent to them.

The help given by the various persons who abstract for the bureau is also much appreciated. This arrangement applies to Holland (up to July, 1936), Finland, Hungary, Czechoslovakia and Poland.

OTHER BUREAU SERVICES

As already stated, there is a constant demand for translations and bibliographies. In addition there is an ever-increasing correspondence with investigators desiring special information

or plant material from other lands. The following notes will give some idea of the nature of this work.

Country	*Subject*
Aberystwyth, Wales	Collection of seed of superior strains of grasses (*Lolium, Phleum, Festuca, Poa, Dactylis, Phalaris,* etc.) from Scandinavia, Germany, Switzerland and France.
,, ,, ...	Collection of seed of red clover strains reputed to be resistant to clover rot (*Sclerotinia trifoliorum*) from Scandinavia, Czechoslovakia, and other European countries for testing in the West of England.
,, ,, ...	Collection of data regarding incidence of gall midges on seed plots in the Dominions.
,, ,, ...	Collection of information from Hungary regarding control of *Apion* attack on clover seed plots.
Cambridge, England	Supplying seed of new strains of silage maize from Hungary.
Ottawa, Canada	Seed production of white clover.
,, ,, ...	Information regarding origin of varieties of swede turnip that have proved resistant to club root.
,, ,, ...	Supplying seed of new variety of silage maize from Hungary.
Nova Scotia, Canada	Information regarding the value of *Spartina Townsendii* in tidal marshes.
Canberra, Australia	Supplying seed of new variety of silage maize from Hungary.
Adelaide, ,, ..	Collection of seed of *Bromus unioloides* and *Trifolium fragiferum.*
Sydney, ,, ...	Collection of seed of North African and Italian lucerne from Bari, Italy.
,, ,, ...	Collection of seed of Kaiserie lucerne from Turkey.
Muresk, Western Australia ..	Collection of samples of horse beans with a short growing period to replace white field peas, now being severely attacked by the pea weevil.
Pretoria, South Africa	Collection of seed of 14 grass species and 8 legumes and of the *Triticum-Agropyrum* hybrids from U.S.S.R. Also 7 species of *Vicia* from France. Also 4 species of *Lotus* from Australia and New Zealand.
,, ,, ...	Supplying seed of new variety of silage maize from Hungary.
,, ,, ...	Collection of seed of Thuringian lucerne.
,, ,, ...	Collection of Italian lucerne strains from Bari, Italy.
Durban, South Africa ..	The use of *Spartina Townsendii* for controlling erosion.
Cape Province, ,, ..	Tests with *Spartina Townsendii.*
Southern Rhodesia	The depilatory action of *Leucaena glauca* (a valuable fodder crop locally) on various classes of stock, as suggested by a French writer.
Nairobi, Kenya	Purchase and dispatch of grass seeds to the Director of Agriculture.
,, ,, ...	Collection of seed of North African and Italian lucerne seed from Bari for the Officer in Charge of Grassland Improvement.
,, ,, ...	Collection of seed of annual lucernes (*M. orbicularis* and *M. arabica*) from U.S.S.R.
Palestine	Collection of seed of new variety of silage maize from Hungary.
,, ...	Collection of seed of strains of lucerne suitable for poor hill slopes experiencing 3 months drought.

It is always advisable to assist foreign enquirers as well, since this may assist in correspondence later regarding Empire enquiries or may lead to subscription for our publications.

The following are some examples of the type of work done :—

Country	*Subject*
Argentina	Collection of seeds of forage plants.
France	Identification of a Palestine clover (from an Australian correspondent), entailing the collaboration of the Director of Agriculture and Forests, Palestine.
Germany	Collection of Grimm lucerne seed from Dr. L. E. Kirk, Canada.
Italy	Collection of Common American lucernes from U.S.A.
Norway	Information regarding Soviet work on cultivated clovers.
U.S.S.R.	Seed and herbarium photographs of lucerne varieties, supplied from New Delhi, India.

It will be obvious that the majority of the items noted above are concerned with the interchange of seed of herbage and forage crops. There has been a welcome increase in the number of requests for purchased or other high-class strains; a particular example which may be mentioned is the excellent reception accorded in the United States and Canada to the pasture strains of timothy bred at the Welsh Plant Breeding Station by Dr. T. J. Jenkin.

FOURTH INTERNATIONAL GRASSLAND CONGRESS

This Congress is to be held in Aberystwyth in July, 1937, under the presidency of Professor Stapledon. The Joint Secretaries are Mr. Wm. Davies of the Welsh Plant Breeding Station and the Chief Officer of the Bureau. The staff of the bureau is sharing in the work of general preparation, and the many connections which have been acquired during the past years in British and foreign countries will be valuable for this type of work. The editorial experience obtained in the production of the Herbage Publication Series will also be helpful in the preparation of the Report of the Congress.

CONCLUSIONS

The bureau publications are now sent to all the more important countries of the world and are widely appreciated. During the year under review, special attention has been devoted to publicity; a press cutting service has been organised whereby authors of papers abstracted in Herbage Abstracts receive a copy of the abstract of their paper, together with an advertisement of our publications and a request for further reprints of similar papers. This has resulted in a rapid increase in our reprint library and in the demand for Abstracts, Reviews and Bulletins.

The organisation which has been built up will be further improved as time and facilities permit; in the meantime it is in an adaptable state should any extension of its terms of reference or other changes be considered necessary. Correspondence and suggestions regarding the operation of the bureau or the production of its publications are always welcomed.

DETAILS OF " HERBAGE ABSTRACTS " AND " HERBAGE REVIEWS "

Herbage Abstracts			*Herbage Reviews*	
	No. of pages	*No. of abstracts and books noted*		*No. of pages*
Vol. I	113	300	Vol. I	174
,, II	227	1,000	,, II	150
,, III	290	1,100	,, III	219
,, IV	313	1,500		
,, V	362	1,900		

APPENDIX IX

IMPERIAL BUREAU OF FRUIT PRODUCTION REPORT FOR 1935–36

PUBLICATIONS

The collection of knowledge by a bureau is valuable only provided there are adequate means of dissemination. The bureau attempts to deal with the problem through the following channels.

1. Horticultural Abstracts

The primary task of the bureau is the issue of its quarterly publication, *Horticultural Abstracts*. In the compilation of this, each separate issue of some 230 periodicals is examined in addition to 1,500 odd separate bulletins and the 40 or 50 annual reports of research stations received yearly in the libraries of the East Malling Research Station and of the Imperial Bureau. Certain other periodicals are also consulted at the Science Library, London.

In 1931, the first year of issue, abstracts numbered 428 and covered 128 printed pages. In 1935, the last completed year, abstracts amounted to 747* and pages to 288. Abstracts have become not only more numerous as further sources of information have been tapped, but also fuller to meet the expressed demand for such abstracts. Not only do these abstracts cover all temperate and tropical fruits and such perennial tropical crops as tea, coffee, etc., but also, in response to persistent requests, sections are now devoted to flower and vegetable growing.

Originally only 500 copies of each number were printed, but with increased circulation the number was raised in 1933 to 600. In 1935 the free list of recipients amounted to 237 while the number of subscribers or of persons or institutes receiving the journal in exchange or in return for services rendered was almost identical, namely 238. Numbers of subscribers are steadily increasing and the number of subscriptions already received for the 1936 volume (on June 20, 1936) namely 122, is considerably greater than that received for the 1935 volume on the corresponding date last year. Favourable and unsolicited comment is received from all parts of the world.

The reference value of the abstracts is increased by the fact that all abstracts appear indexed according to the Universal Decimal Classification system, which enables them to form an adequate subject index without more ado, the author, title of article, source and classification number being specially confined on an area of paper suitable for pasting on to a 5 in. by 3 in. filing card. Moreover, for the benefit of those who prefer older methods an alphabetical subject and author index is issued yearly. Incidentally the bureau files contain an alphabetical subject index of Horticultural Abstracts from the beginning. This is of the greatest assistance in tracing recent published work on any particular subject and if published say, at the end of the first ten years, it should be no less useful to horticultural workers who possess a set of the abstracts. Yet more and more is it realised by personal contact and by correspondence with workers in distant parts of the Empire that, even if the full 600 copies were at once judiciously distributed to those who could advantageously use them only the mere fringe of the individual research workers would be touched by such an issue.

2. Technical Communications and Occasional Papers

Up to April, 1935, six Technical Communications and four Occasional Papers were issued by the bureau. The two main factors which have always determined the issue of such publications are a large number of enquiries on any given subject or the fact that in any particular field

* Exclusive of some 60 papers noted but not abstracted.

of horticultural research such progress has been made as to merit a summary of the present position, or often a combination of both. Publications which were largely due to repeated enquiries were Technical Communication No. 1, *The Ringing of Fruit Trees* (stencilled) later reproduced in the Agricultural Journal of India, Technical Communication No. 3, *Investigations on the Standardisation of Citrus Trees by Propagation methods*, Technical Communication No. 4, *Problems of Fruit Tree Nutrition*, and Technical Communication No. 6, *The Nutrition and Manuring of Soft Fruits*, while Technical Communication No. 2, *Field Experiments in Horticulture* —which has incidentally from the first been a "best seller" and is still in steady demand—and Technical Communication No. 5, *The "Degeneration" of the Strawberry*, belong rather to the second category. Of the Occasional Papers, Occasional Paper No. 3, *Annotated Bibliography on Bitter Pit*, was in answer to the urgency of the problem in New Zealand and has been received enthusiastically wherever apples are grown. Incidentally it formed the subject of a special appreciation from the New Zealand Council of Scientific and Industrial Research.

3. Other Publications

Other unclassified publications include the reissue of an article by A. P. C. Bijhouwer on *Old and New Standpoints on Senile Degeneration* published in the Journal of Pomology and Horticultural Science, and an *Index to the First Ten Volumes of the Journal of Pomology and Horticultural Science*. This was actually published by the editors of the journal, but the entire work in connexion therewith was done by the bureau as part of its endeavour to facilitate easy reference to all authoritative, horticultural research work. It may be of interest that this index has been taken as a model by the Association of Applied Biologists which is on the point of issuing a similar index for the Annals of that Association.

4. Publications in 1935/36

The year 1935/36 saw the issue of Technical Communication 6 and Occasional Paper 4.

The latter contained a brief account of the work of tropical and sub-tropical interest already undertaken by the bureau.

In issuing Technical Communication No. 6, *The Nutrition and Manuring of Soft Fruits*, a reprint of a recent article by Dr. T. Wallace of Long Ashton, the bureau helped to disseminate that knowledge for which there has been a persistent demand during the last ten years. Both this article and the two previous articles by Dr. Wallace, which were issued as Technical Communication No. 4, were originally published in journals which despite their considerable circulation are almost certain not to be seen by the research worker widely separated from a good library, and it was on this account that the bureau decided to reissue them. Of Technical Communication No. 4 some 320 copies have been distributed free or in exchange and 88 copies have been sold. The sale of Technical Communication No. 6 has just started.

Further, with a view to popularising the work of the bureau, the opportunity was seized of contributing an article to the Empire Trade Number of the Fruitgrower issued on March 5, 1936. In it the Chief Officer briefly describes the work and functions of the bureau and discusses the best methods by which workers on fruit problems can make use of this organisation.

5. Publications in Preparation

Other publications, the first of which is already issued and the second on the verge of issue may be noted :—Technical Communication No. 7, *The Vegetative Propagation of Tropical and Sub-Tropical Fruits*, containing an appreciative foreword by Sir Geoffrey Evans, Director of the Imperial College of Tropical Agriculture, Trinidad, and incorporating suggestions made by Professor E. E. Cheesman of that College, carries a stage further information previously issued by the bureau.

In Technical Communication 3 issued in 1932 the information available in scattered form on the standardisation of citrus by propagation methods was presented concisely. Partly as the result of this, requests have since been received for information on the propagation of other sub-tropical fruits, and Technical Communication No. 7 is in answer to these requests. In it

the vegetative propagation of nearly 100 tropical or sub-tropical fruit trees is dealt with. Judging by the reception accorded to Technical Communication No. 3, Technical Communication No. 7 should prove a useful reference work especially to the isolated worker.

Technical Communication No. 8, *A Summary of the Position regarding the Woolly Aphis, (Eriosoma lanigerum Hausm)*, is also now complete. This publication is the direct outcome of the Director's world tour in 1930/31, during which he found in very many of the apple-growing districts of the Empire a widespread dissatisfaction with the apple root stocks in common use and an urgent demand for good immune stocks and for a knowledge of all methods, chemical, biologic or cultural whereby the menace of this pest can be eliminated. The present Technical Communication is based not only on an exhaustive survey of the literature—an annotated bibliography of 600 references is included—but also on the replies to a questionnaire sent out by the bureau in 1933 to every part of the world where woolly aphis was known to be troublesome. Such knowledge is essential to all working on apple rootstock problems. It is of interest to note that at the moment of going to press with this memorandum a cable has been received from the Imperial Agricultural Research Council of India with a request for the reservation of a large number of immune stocks for use in solving this particular problem.

Progress has also been made in the compilation of other publications. (1) *Frost and Winter Injury*. The very serious losses to English fruit caused by the late frosts of May, 1935, led to an increasing number of enquiries on methods of control or prevention of damage and a publication is in preparation—certain sections being already completed—which, being a full survey of the literature, should form an excellent basis for the research work on the subject, which it is hoped to develop in the near future in England. It should be noted that the publication will deal not only with frost damage to blossom or fruit in the spring but also with winter injury to fruit trees, which is a serious problem in Canada and other parts of the Empire.

(2) *Incompatibility*. Another subject which is the inevitable outcome of persistent rootstock investigations is the vexed question of incompatibility between stock and scion. The term itself has in the past been used extremely loosely and as a not very surprising result opinion as to the compatibility of any particular stock and scion varies exceedingly. The bureau has already gone far in disentangling the different threads from the available, often contradictory, literature preparatory to issuing a communication on the subject.

(3) *Biennial Bearing*. Now that the research worker is beginning to be surer of his material he can essay a problem which was always in the past regarded as the inevitable bugbear of the fruitgrower, namely, the uneconomic habit which many fruit trees have of bearing adequate crops in alternate years only. In 1935 the Imperial Agricultural Research Council of India sent their mango officer to study biennial bearing at East Malling. His first request was for references to the relevant literature. A short bibliography and review was immediately given to him by the bureau and a promise was made of a fuller account at a later date. This work is now in progress and the findings will be published when complete.

(5) *Irrigation in the Orchard*. The work of Rogers at East Malling in perfecting apparatus to detect soil moisture and the practical application of the method of detection to a determination of the desirability of irrigation and the amount of irrigation necessary has excited the interest of all horticulturists who both wish to know something of the effectiveness of their rainfall and who are also faced with the necessity of applying additional water. Considerable material has been collected towards a communication on the subject.

Other problems which have of recent years received considerable attention from horticultural research workers and which, by reason of their complexity or novelty, demand a summary of the situation in the near future include :—the injection of fruit trees, rootgrowth in fruit trees, storage and transport of citrus, etc., etc. Many such summaries would already have been published, but for the lack of man power and for the presence at East Malling of the two workers chiefly responsible for the first two of the above research problems, a fact which has so far enabled the bureau to refer its queries on injection and rootgrowth to those workers themselves.

SERVICES RENDERED.

Among the services rendered by the bureau in its capacity as a storehouse of knowledge is that of answering queries.

1. *Replies to Queries*

The number of queries involving work, which may vary from an hour or two to a week or more, has averaged in the last two years something approaching 2 a week. Enquiries have ranged from the verification of a reference to the demand for a complete treatise and have touched every phase of horticulture.

Enquiries in 1935–36 were fairly typical and it may be helpful to give a few examples of points dealt with during that period. Thus information was given on the propagation of nuts, apples, apricots, grapefruit, deciduous fruits in general, and of satsuma orange and on the method advised for packing citrus budwood for transport from California to Palestine. Storage questions included the building of ventilated stores, citrus and walnut storage, gas storage, wrappers for use in storage. The effect of manuring on storage has also been the subject of enquiry. The majority of questions received on manuring this year actually referred to the new methods of injection now under investigation by Roach (*see* last para. of *Publications in preparation*). This work is in its infancy and, by the very terms of its establishment, the bureau is precluded from publishing original work, but it is nevertheless keeping a watchful eye on events, and, when the time is ripe, it hopes at least to be ready to issue a summary of progress made.

In point of numbers of queries necessitating investigation and answered at some length the United Kingdom comes easily first in 1935–36 with 24 enquiries, but of these a considerable number was on behalf of someone in or about to proceed to one or other of the Crown Colonies. Next comes South Africa with 7 considerable queries, followed by Canada and Australia with 6 each, India 4, New Zealand, Cyprus and Palestine 3 each and other parts of the Empire with smaller numbers.

No fewer than 10 queries were received from abroad, 3 of them being from Germany and 2 from the United States. All were treated in the same way as queries from the Empire in view of the very ready response which the bureau has almost invariably received on writing for information to foreign research workers. Difficulty in obtaining foreign publications has been experienced in one quarter only, namely the Dutch East Indies. The bureau's relations with the research workers there are excellent, but it has for some 2 years now been impossible for outsiders to get certain important publications issued in Java. Hence, in replying in full to a query from the Director of one of the Dutch East Indian Stations, the opportunity was taken of suggesting the desirability of some revision of procedure, if the bureau were to be expected in future to continue to give information.

2. Translations

Several requests for translations were answered during the year, notably one for a translation from the Italian for Vineland, Canada, and two long translations of 49 and 38 pages each from the French for Victoria (Aust.). Incidentally all the above requests arose from perusal of abstracts in Horticultural Abstracts. Translations from these and other languages have been requested and made in all previous years.

3. Bibliographies

In answering a large number of the queries a short bibliography forms part of the reply, but from time to time a specific request is received for bibliographies on particular phases of horticultural work. In 1935/36 such comprehensive bibliographies were supplied on tea and rubber growing, on the cultivation of almonds and on citrus storage.

4. Itineraries

As contacts increase the bureau becomes continually in a better position to advise overseas workers on the European centres likely to be of particular interest to individual workers. In

1935/36 itineraries were drawn up and introductions were given for research workers from Ceylon, Canada, South Africa and England wishing to visit the European mainland. In previous years similar advice has been given on visits to districts particularly interesting to those working on vines, citrus, silk production, rice, etc.

5. Plant Material

The bureau is frequently asked to obtain plant material both for the tropics and for temperate regions. Its attachment to East Malling naturally is of the greatest assistance with regard to the latter. In 1935/36 plant material was obtained or sources were verified in response to requests from Victoria (Aust.), N.S. Wales, Tasmania, India (2) and Canada (5). The material required has ranged from tropical seeds to cold-resistant shrubs from the Balkans.

6. Post graduate Students

Now that East Malling has become a centre for post graduate study, it has fallen to the bureau to help those students in finding references to their work and in getting for them on loan literature required, and sometimes even in being understood, *e.g.*, students from mandated territories such as Palestine and other foreign students.

7. Proof Correcting of Overseas Mss.

Among duties which the bureau has undertaken at the request of overseas workers is that of seeing approved manuscripts through to publication especially in the Journal of Pomology and Horticultural Science. This work frequently entails the verification or addition of references and is apparently much appreciated.

CONTACTS WITH RESEARCH

1. Relations with other Bureaux

The closest touch is kept with other bureaux particularly with the Soil Science bureau at Rothamsted and the Plant Breeding bureau at Cambridge, since with these inevitably overlapping occurs. Far from meaning, however, a series of minor irritations, overlapping has actually proved an additional source of strength and in many cases an approach to a further source of knowledge which might otherwise have remained untapped.

2. Relations with Research in the Empire

The bureau's relations with the East Malling Research Station and with the other horticultural research centres remains equally happy and may be gauged by the valuable help afforded by these centres in the production of bureau publications, notably by Dr. Wallace of Long Ashton, and Messrs. Hoblyn, Massee and Harris of East Malling and Dr. Berkeley of St. Catherine's, Ontario.

One of the main functions of a bureau, as originally laid down, was to keep in touch with horticultural research programmes throughout the Empire.

By the courtesy of the Directors of the Long Ashton and East Malling Research Stations, the bureau was present at the two joint staff meetings of these Institutes held in 1931 and 1936 respectively, and was unanimously requested to take responsibility for the minutes taken.

With regard to horticultural research in other parts of the Empire the attainment of knowledge on research work in progress still leaves something to be desired. Whilst it is fully realised that research workers cannot be constantly worried for revised editions of their research programmes, it is felt that possibly the official correspondents might in many cases be in a position to ensure that brief synopses of work in progress at individual institutes and under the auspices of research councils in different parts of the Empire should reach the bureau regularly. Most of these bodies surely possess such statements. Still a great deal of information has been gained by correspondence, by personal visits made by overseas research workers to the bureau and especially by the Director's visits to Canada, New Zealand, Australia and Ceylon in 1930/31 and to South Africa in 1936.

In the case of the last visit, made by Mr. Hatton in his capacity as Director of the East Malling Research Station at the invitation of the Union Government, the Executive Council of the bureaux seized the opportunity of adding material and moral support to enable him to explain and demonstrate, as had not previously been possible in S. Africa, the work of the bureaux in general and the opportunities afforded by them, and of course in particular to fruit workers by the bureau of Fruit Production.

Conferences

(*a*) Imperial

It may here also be recalled that in 1930 the first year of its existence, acting on the recorded opinion of the Imperial Agricultural Research Conference of 1927 that "Special and regional conferences are desirable—" the bureau of Fruit Production called a Conference of Imperial Horticulturists in London. This fortunately coincided with the gathering of the International Horticultural Congress, which meets triennially. At this conference official delegates from 25 overseas Governments were present as well as representatives of overseas agricultural departments and of horticultural research stations both at home and overseas. The proceedings were printed and issued in three parts dealing respectively with: (1) the economic and administrative side of horticulture, (2) the application of science to horticulture, and (3) fruit storage. These have long been exhausted, though the demand for Part 3 in particular still exists.

Since then advance in horticultural science has been so rapid in general experimental technique, in method of plot lay-out and in other fundamental issues that the time for another Conference is already overdue. It is much hoped that regular conferences—perhaps coinciding with the international gathering already referred to—may become a recognised part of the bureau's activities.

(*b*) International

The 11th International Horticultural Congress was held at Rome in September and both the Director (at the charges of the Ministry of Agriculture, London) and the Chief Officer attended.

Not only was useful work done in certain of the sections of this Congress, but also, as is usual on such occasions, valuable contacts were made with other research workers, notably with Palestinian horticulturists, with Professor Stoitschkoff of Bulgaria who is in close touch with the work of Atanasoff, with Polish workers at Skierniewice and with other foreign scientists. Moreover by participation in the Northern tour it was possible to appreciate the eminently sound fruitgrowing practice in the Massalombarda district of Northern Italy and the sane methods of horticultural education adopted. The reception of the bureau representatives was extremely cordial everywhere and excellent relations with all the Italian workers with whom the bureau came into touch were established, notably Professor Pirovano of the Electro Genetic Station of Giottarossa near Rome, Professor Casella, Director of Acireale Citrus Research Station and High Commissioner-designate—of Italian Horticulture, and others.

Visitors

The number of visitors was almost exactly the same as in the previous year, the following countries being represented:—Canada 5, S. Africa 4, India 3, West India 3, Australia 2, New Zealand 2, Kenya 1, Mauritius 1, Uganda 1, Malaya 1, Egypt 2, France 1, Sweden 1, Spain 1.

In addition to these, most of whom were engaged on research, a large number of other visitors were actually met by the bureau when visiting the East Malling Station. Frequently the bureau has been called on to interpret. In all cases possible and necessary the opportunity

was seized of explaining the bureau's work and of determining the position of horticultural research elsewhere.

DETAILS OF HORTICULTURAL ABSTRACTS

	No. of pages.	*No. of abstracts.*	*No. noted.*
Vol. I	128	428	—
,, II	180	421	47
,, III	223	616	66
,, IV	244	696	108
,, V	288	747	58

APPENDIX X

IMPERIAL BUREAU OF AGRICULTURAL PARASITOLOGY REPORT FOR 1935–36

With the year under report the Imperial Bureau of Agricultural Parasitology completes seven years of activity. During the year one of the two Deputy Directors, Dr. J. N. Oldham, resigned on obtaining an appointment in London. The technical Staff has now been trained in the special methods and technique of the subject and has been put on a financial basis which gives promise of continuity in the work.

The Bureau has taken over complete control of " Helminthological Abstracts " which had during the previous 3 years been edited and published as a supplement of the " Journal of Helminthology ". This accession has placed upon the Staff new and considerable burdens with which, however, they have successfully coped. It has necessitated moreover a removal from the premises formerly occupied at the Institute of Agricultural Parasitology to Winches House, and this removal has not only provided more commodious premises for the scientific and technical Staffs of the Bureau, but has also solved, for some years at least, the growing and pressing problem of storage accommodation for the rapidly accumulating stocks of the Bureau's publications and its inevitably increasing files of scientific periodicals.

The London Office at the London School of Hygiene and Tropical Medicine has been retained as a convenient and central port of call for those visitors who wish to consult the Bureau Staff and have not the necessary time in which to travel out to St. Albans. Duplicates of Office Correspondence and of the Cumulative Authors' Catalogues are also filed in the London Office for reference and as a safe precaution.

(*a*) Technical Communications

The total number of Technical Communications issued up to date is 18. Of these 2 were published during the current year : one on " The Pathology and Aetiology of Plant Lesions caused by Parasitic Nematodes " was prepared at our request by Dr. T. Goodey and brings together a number of widely scattered facts and theories on a very important aspect of plant eelworm disease. The second communication entitled " The Bearing of the Physiology of Parasitic Nematodes on their Treatment and Control " was prepared by Dr. Lapage and discusses the present unsatisfactory state of our knowledge of helminth physiology. It also offers helpful suggestions of the directions which future work might usefully take.

These Technical Communications, having as their objective the stimulation of further research, are widely and freely distributed to investigators within the Empire. Naturally the result of such a policy of distribution limits the number of sales, but several copies have been ordered by and sold to foreign workers.

(*b*) Subjects of Special Interest

The following problems and control methods are at present exciting considerable interest in various parts of the world :

(i) Hot-water treatment of bulbs or root-stocks of plants infested with eelworms.
(ii) Chemical treatment of soils to control eelworms.
(iii) Problem of dosing ruminants with anthelmintics (difficulty of avoiding the drugs being side-tracked into the rumen).
(iv) Rapid strides in elucidating lungworm life-histories and thence the possibility of introducing adequate control-measures directed against the intermediate host (molluscs, earthworms).

(v) Seriousness of helminth disease in fur animals. (By common consent, helminths constitute the most important agents of disease in these animals, especially in Silver Fox and Mink.)

(*c*) Special Occurrences during the Year

At the suggestion of the Ministry of Agriculture and Fisheries in England the Bureau received an official visit from the Annual Conference of Veterinary Advisors to whom the technical working of the Bureau was explained.

Among the various distinguished visitors who came to the Bureau and studied its methods the Director of Research in Canada may be specially mentioned.

(*d*) Services Rendered

The more extensive services rendered during the year by the Bureau Staff may be summarised as follows :

(i) A special report was prepared at the request of the Agricultural Research Council of England on the present position of eelworm diseases of agricultural and horticultural crops in England and Wales.

(ii) Preparation and issue of translations of papers or portions of papers dealing with helminthological research.

(iii) References on specific problems have been collated from published literature for a number of Bodies and individuals, including such subjects as eelworm control (for the Rhodesian Tobacco Association), Hydatid, physiology of Ascaris, and the anthelmintic value of copper sulphate. An extensive list of references was also prepared by request on Blackhead in Turkeys.

(iv) Technical advice has been given by the Bureau Staff on control methods, *e.g.*, the problem of eelworm in coffee plantations in India was dealt with fully. Supplies of research material have been obtained and forwarded to investigators in Canada and the Irish Free State.

(v) Identification of specimens—which is officially outside the range of the Bureau's work—has been sought on several occasions. The Bureau has been able to persuade one or other of the English investigators to undertake this task voluntarily.

(vi) Periodicals have been issued on loan on a number of occasions.

(vii) Orders have been placed on behalf of Overseas Correspondents for scientific books. Advice has been given on papers prepared for publication and in some cases their publication in scientific journals has been arranged, and the Bureau has avoided delay by undertaking the proof reading.

(viii) Enquiries regarding vacant appointments at various centres have been dealt with.

(ix) A number of helminthologists from overseas and at home have been given introduction to research centres and to individual investigators in this country and elsewhere. The African Research Survey was put in touch with helminthologists in other countries holding possessions in Africa.

(x) A number of enquiries of a non-helminthological nature were forwarded to the appropriate information centre.

(*e*) Services Specially Appreciated

While a number of letters of appreciation for the services of the Bureau have been received by the Bureau it is a matter for comment that there has been a lack of due published acknowledgment of the expert and technical advice and assistance given in the supply of detailed bibliographies by the Bureau Staff.

There have been many spontaneous expressions of appreciation on the value of " Helminthological Abstracts " both from workers in the Empire and from foreign countries including the United States of America and Russia. At the same time useful suggestions for the improvement of this publication have been received and welcomed.

A special service which the Bureau had undertaken during the previous two years, viz. : the issue to the principal centres for helminthological research in South Africa, Australia and Canada of duplicate typed loose-leaf references on current literature has unfortunately had to be suspended during the current year, owing to the increased amount of work thrown on to the small Staff when the whole responsibility of the preparation and publication of " Helminthological Abstracts " was assumed by the Bureau. This service was abandoned with very great regret and only after the most careful consideration.

The Director and Deputy Director attended by invitation a conference of the British Society of International Bibliography and after listening to the discussion on decimal systems of classification, including the Brussels system, were confirmed in their considered opinion that it was inapplicable to zoological literature and to the special requirements of this Bureau.

As Director of the Bureau I should like to express my appreciation of the services rendered by the Staff during the past year.

DETAILS OF THE BIBLIOGRAPHY OF HELMINTHOLOGY AND OF HELMINTHOLOGICAL ABSTRACTS

Bibliography of Helminthology.			*Helminthological Abstracts.*		
	No. of pages.	*No. of entries.*		*No. of pages.*	*No. of abstracts and titles.*
1930 ..	88	1,094			
1931 ..	93	1,298			
1932 ..	97	1,326	Vol. I	282	894
1933 ..	101	1,394	,, II	270	954
1934 } Incorporated in Helmin-			,, III	280	1,358
1935 } thological Abstracts.			,, IV	Not yet completed.	

APPENDIX XI

FARNHAM HOUSE LABORATORY
REPORT FOR 1935–36

Farnham House Laboratory, established in 1927, is concerned with the study and distribution throughout the British Empire of the beneficial insects that attack injurious insects and noxious weeds. It was created in the belief that an Imperial centre for work of this type would be a convenience to the Entomologists of the Dominions and Colonies, since many of the pests with which they have to deal are of European origin, whose enemies must be collected in Europe; while the parasites and predators required for others can often be most readily transhipped via London.

Since the foundation of the Laboratory, work has been undertaken on forty-five species of insect and plant pests on behalf of the following countries: Great Britain, Canada, Australia, New Zealand, South Africa, Irish Free State, India, Ceylon, Kenya, the West Indies, Cyprus, Fiji, Falkland Islands. Assistance in connection with certain projects has also been given to the United States of America, France, Poland, Germany, the U.S.S.R., Egypt, and Madeira. The following table gives the number of shipments of beneficial insects (or host insects more or less heavily parasitised by them) and the number of specimens shipped each year since the foundation of the Laboratory:

Financial Year	*Shipments*	*Specimens*
1927–28	9	6,339
1928–29	35	62,213
1929–30	35	247,673
1930–31	62	323,777
1931–32	60	432,978
1932–33	54	340,736
1933–34	94	1,219,738
1934–35	166	5,298,274
1935–36	116	3,133,625
Total	631	11,065,353

The figures for the financial year 1935–36 are lower than those for the preceding year, owing to the unusual scarcity, due to unfavourable weather, of some of the principal insects collected.

In the early years of the work, when financial support was derived mainly from the Empire Marketing Board, the needs of the Dominions and Colonies were met, as far as possible, out of current income. It soon became apparent that a normal extension of the work was not possible on this basis and that additional funds must be, directly or indirectly, provided by interested Governments in order that their special requirements might be met. The problem has been solved in various ways. Most Governments have made direct contributions, either independently or on a co-operative basis, in conjunction with the Empire Marketing Board, for which services were rendered and material collected. The Australian Government maintains its own Officers at the Laboratory, providing funds to cover the increase in overhead expenditure thereby entailed. For work in the West Indies, a member of the Staff, financed for some years by the Empire Marketing Board, but later from various other sources, was specially detailed. For an extensive investigation required by Mauritius, another Entomologist from the Laboratory was seconded to the Agricultural Department of the Colony.

In 1933, when the Laboratory was placed under the Council of the Imperial Agricultural Bureaux and its finances placed on a co-operative basis, it became necessary to devise a uniform

and equitable basis of assessing the charge made for work that could not be properly or adequately financed out of the current income. The system ultimately adopted, applying to any project involving more than two days' continuous work by any member of the Staff, was as follows :

(i) A fee equal to half the salary of the Officer undertaking the work during the time he is engaged on it, with allowances for statutory leave and holidays.
(ii) Out-of-pocket expenses.
(iii) Travelling and subsistence allowances.
(iv) A five per cent. overhead charge on the total of (i) and (ii) above.

This system, as will be seen, takes into account not only the time spent in the work but also its intrinsic difficulty, as indicated by the standing of the Officer assigned to it. The overhead charge enables the Laboratory to recover, partially, losses due to wear and tear and expenditure necessitated by the work but not assignable to any special project.

The Committee of the Imperial Entomological Conference, meeting in London in September 1935, discussed this plan and accepted it, but all members agreed* that, with effect from 1st April, 1936, the whole salary of assistants engaged on specially ordered work should be charged for such time as they are so engaged, instead of half-salaries as had originally been arranged. However, when in the early part of 1936, the amounts available for the various projects were definitely settled, it became clear that the fee charged on this basis would absorb so large a proportion of the funds that work would be seriously hampered. The Council of the Imperial Agricultural Bureaux, notified of this fact, therefore authorised the retention of the old system until the meeting of the Imperial Scientific Conference in the autumn.

The funds provided by Governments and Departments for work on special projects, during the financial year 1935–36, amounted to £3,128 0*s.* 10*d.* of which £2,811 15*s.* 7*d.* was provided by Canada, £228 8*s.* 4*d.* by the Forestry Commission of the United Kingdom, and £87 16*s.* 11*d.* by New Zealand. The allotment from Canada included two contributions, each of 2,000 dollars, from the Government of the Province of Quebec and the Quebec Forest Industries Ltd., respectively. In addition the sum of £10 4*s.* 6*d.* was realised by the sale of natural enemies of the Woolly Aphis and the Greenhouse Mealybug.

THE WORK OF THE LABORATORY

The final object of the work of the Laboratory is the control of injurious insects and noxious weeds by means of the beneficial organisms—particularly the predacious and parasitic insects—that prey upon them. The discovery, transfer, and utilisation of beneficial insects often necessitates, however, a great deal of preliminary investigation. In many cases, the injurious insects and plants whose parasites are required, have not been sufficiently studied and little or nothing is known about their natural enemies. In different parts of the region in which it is found a pest may be attacked by different enemies. In the present state of our knowledge it is practically impossible to say, without careful study, whether a given parasite or predator will be successful as a controlling agent in the region where the host is a pest. This means, in practice, that as many natural enemies as possible must be introduced. Thorough, large-scale collections over extensive areas must therefore be made.

The separation and identification of parasitic insects is notoriously difficult, and though the help of a few competent specialists is available, the full value of their services cannot be obtained by the field worker unless he himself has a fair working knowledge of the parasitic groups and is able to detect and appreciate the slight and delicate differences by which species are distinguished.

Again, it is a well-known fact that of the parasites and predators associated with a pest, not all are beneficial. While some are true primaries, attacking the pest itself, others are secondary, living often, or always, at the expense of the primary parasites, whose efficiency they reduce, sometimes almost to vanishing point. Careful studies of the life-history and habits of the natural enemies are therefore necessary and sometimes consume much time during which

* Report of the Fourth Imperial Entomological Conference, 19th-27th September, 1935, Appendix Ia par. 25.

no practical steps can safely be taken. Another reason why such studies are necessary is that since parasites must often be shipped to places far distant from the country of origin, collections must be made while they are in an early stage of development, so that they do not reach the adult stage and die during the course of their long journey. The parasites cannot, however, be collected in the early stages unless they can be identified and for this a close study of the structural character of these stages, which are entirely different from the adult form, is indispensable. Biological studies are also necessary to determine the proper stage, time and method of shipment and the conditions under which field liberations should be made in order to understand the reasons why certain species succeed as controlling agents, under given conditions, while others fail.

For these and many other reasons, research on parasite biology and the problems of biological control is a necessary part of the work of Farnham House Laboratory, as was recognised by the Committee of the Imperial Entomological Conference.* The heavy pressure of practical work has made it difficult for the members of the staff to find sufficient time for research work, even in connection with important projects. Valuable assistance in this field has been rendered by voluntary workers, attracted to the Laboratory by their interest in its problems, and maintained, in most cases, by funds from outside sources, such as the Ministry of Agriculture, the Carnegie Trust, and the Agricultural Research Council; but though their help has been of great benefit, a more permanent and adequate provision for continuous research work is necessary.

The provision of training, advice, and information on biological control also forms an important part of the work of Farnham House. A number of entomologists from the British Dominions and Dependencies, as well as from foreign countries have visited the Laboratory to obtain training in its methods or advice in regard to their problems, and maintain correspondence with its staff. The Parasite Catalogue, maintained at Farnham House comprises references to the parasites and predators of the injurious insects of the world, with cross-references under the names of the pests themselves. So far as is known, this is by far the most complete catalogue of its kind and its possession enables the Laboratory to supply information concerning the natural enemies of pests at short notice. The Committee of the Fourth Imperial Entomological Conference expressed the hope (Report, Appendix IA, par. 27) that the Council would consider its publication and arrangements with a view to this are now under discussion.

The work undertaken on specific projects during the financial year 1935–36, has been as follows:—

INSECTS AFFECTING CEREAL AND FORAGE CROPS

Western Wheat-Stem Sawfly (*Cephus cinctus*, Norton).

The Wheat-stem Sawfly is an insect native to North America, which has gradually spread from wild grasses to cultivated grain crops and will probably become more and more injurious as time goes on. Its larva bores in the stem of the wheat plant and it is considered by the Canadian entomologists to be the most serious pest of this crop in the Western Provinces, where the loss due to its ravages has, in some years, been estimated at over £2,000,000. The native parasites of this insect, though effective against it in wild grasses are apparently of little use in these grain fields, one reason being, it seems, that their ovipositors are too short to reach the Sawfly larva in the wheat stem.

The indigenous parasites of the Sawfly cannot, therefore, be utilised: But, as it happens, there is, in Europe, a closely allied species (*Cephus pygmaeus*, L.) normally living in wheat. An investigation of this species was therefore undertaken and showed that the pest is attacked in wheat by a considerable number of parasites which destroy, taken together from 70 per cent. to 100 per cent. of the larvae.

As the most important parasite (*Collyria calcitrator*, Grav.) has only a single generation a year, like the sawfly, its host, and since the latter can only develop in the stem of the living

* Report of the Fourth Imperial Entomological Conference, Appendix Ia, par 21.

wheat plant, breeding the parasites in the Laboratory is impracticable and it is necessary to rely on field collections. An extensive series of sample collections of wheat stems was made throughout the main wheat-growing areas of England. This revealed the district where the Sawfly was most common and a more detailed study enabled us to select the fields in which larvae were both abundant and heavily parasitised. The larva of the Sawfly descends into the lower part of the stem some little time before the wheat is cut. It is, therefore only necessary to purchase the stubble of infested fields. This is carefully removed, cleaned, packed, and shipped to the Laboratory. Here it is stored in a cool place, and, during the winter months, sorted and carefully examined, only those containing the hibernating larva of the Sawfly being retained for shipment, which is made in cold storage. On arrival in Canada, the material is kept at low temperature throughout the winter, but removed to a warm place in spring, so that the parasites emerge and can be liberated in the infested fields at a time when the pest is available in the appropriate stage for attack.

A few years after the work was begun, the Canadian entomologists reported that the principal parasite has been established in some of the infested areas. However, as the pest is distributed over the greater part of the Canadian Wheat Belt, it has been thought advisable to continue the distribution of the parasite. During the financial year 1935–36, conditions for the collection were somewhat unfavourable. Nevertheless, 25 consignments, comprising 539,830 cocoons of the Sawfly, of which a high percentage was parasitised, were despatched to Canada, together with 7,700 cocoons of *Pleurotropis benefica*, the second most important parasite of *Cephus*. All of this material arrived in good condition.

INSECTS AFFECTING DECIDUOUS FRUITS

Codling Moth (*Cydia pomonella*, L.).

The Codling Moth is the most important insect pest of the Apple. It is of European origin, but is now distributed over practically all parts of the world where apples are grown. Some years ago, the Laboratory carried out an extensive investigation on the parasites of the Codling Moth in Europe. The results of this, which were published in the "*Bulletin of Entomological Research*" for 1934, form a useful basis for any future attack on the problem. Experimental work on the moth and its parasites was carried out at the Laboratory. A very satisfactory method of rearing the insect and one of its principal parasites was developed. The parasite in question, the Braconid, *Ascogaster quadridentatus*, which had been obtained from America through the courtesy of the United States Bureau of Entomology, was shipped both to South Africa and New Zealand.

During the past year a further request for *Ascogaster* was received from South Africa. A consignment of 700 adults was obtained from America and sent to South Africa by Air Mail. The experiment was unsuccessful, probably because of the adverse conditions experienced *en route*. Since that time, however, the South African entomologists have discovered that *Ascogaster* is established in the Union, as a result of the earlier colonisation. Material for distribution to infested areas can therefore be obtained locally.

The studies made on the parasites of the Codling Moth at Farnham House indicate that most of them are difficult to rear in the Laboratory, and can best be obtained in numbers by extensive field collections, undertaken during the winter months. The economic importance of the Codling Moth and the intrinsic difficulty of combating it, make parasite introduction desirable in all regions infested by the pest. The information now available suggests, however, that some of the European parasites have already been transported with the Moth to certain parts of the world. The first step in the work should, therefore, be a careful survey of the infested areas in order to determine what natural enemies are already present. Further investigation is also required as to the effect produced by arsenical sprays on the parasites, since there are reasons for believing that, under certain conditions, the unaided effort of the natural enemies may produce a fairly low level of damage, though their efficiency is greatly diminished owing to the poisoning of the adults, when arsenical sprays are used.

INSECTS AFFECTING FOREST AND SHADE TREES

The Hawthorn Scale (*Lecanium coryli*, Ledgr.)

The Hawthorn or Hazel-nut Scale is an insect belonging to the Family Coccidæ. It is widely distributed throughout Europe, of which it is a native. It attacks a great many species of plants and has attracted attention in certain areas as a serious pest of plums. It was accidentally introduced into British Columbia in 1903, probably on shade trees from England, and in the absence of any natural parasite, increased enormously. In the autumn of 1924, it was found that practically all the shade trees in the west end of Vancouver, as well as Maple trees in parks, were badly infested. At the request of the Dominion Entomologist, *Blastothrix sericea*, the most important of the European parasites of the Scale, was reared in the insectaries at Farnham Royal and despatched to Canada. In this case the adult insects were sent in cold storage, in glass tubes, with raisins as food. They were transhipped from the Dominion Parasite Laboratory at Chatham, Ontario, to Vancouver, British Columbia, where they arrived, after their 6,000 mile journey with the loss of only a few individuals, and were liberated in the neighbourhood of the city. Further shipments were made in subsequent years. The parasite soon became established, spread rapidly throughout the infested area, and in the course of a few years, practically exterminated the Scale.

Lecanium coryli has now appeared on the eastern side of Canada, in the Maritime Provinces. An attempt was made to obtain the parasite from British Columbia, but the Scale had, by then, owing to parasite attack, become so rare that this was impossible. It was therefore found necessary to renew the collections of parasitised scales in England. During the summer of 1935, two consignments of parasitised scales, comprising 1,835 specimens, were despatched to Canada.

Larch Case Bearer (*Coleophora laricella*, Hb.)

The Larch Case Bearer is the caterpillar of a small moth, and has received this name because of its habit of constructing a silk-lined case formed of pieces of larch needles, from which only the head and anterior part of the body emerge. It is widely distributed throughout Europe, where it sometimes causes severe damage as a leaf-feeder, the effects of its work being, in appearance, rather to those of frost or singeing by fire. It was accidentally introduced into Canada, where biological control offers the only hope of checking its increase and diffusion.

In the summer of 1935, five consignments of cases of *Coleophora* in which a satisfactory incidence of the most important parasites had been demonstrated by the dissection of samples, were shipped to Canada. These cases contained 118,344 specimens, which arrived in good condition, but a full report on the results has not yet been received.

Pine or Balsam Chermes (*Chermes* spp.)

These are Aphids, superficially resembling the Wooly Aphis of Apple, but confined to Conifers. The life-history is complex, involving changes of form in succeeding generations and migrations from one host plant to another. One species of this group (*Chermes pini*, L.), introduced from Europe into New Zealand, does a good deal of damage in the *Pinus radiata* forests there, retarding the growth of the trees and sometimes causing their death. Another species (*Chermes* or *Dreyfusia piceæ*) causes serious injury to Balsam in Canada, where it is known as the Balsam Bark Louse, though apparently of European origin.

These insects are widely distributed throughout Europe, but are preyed upon by several beneficial species, including Ladybirds, the larvæ of certain two-winged flies of the Family Agromyzidæ (*Leucopis* spp.) and some Neuropterous insects of the Family Hemerobiidæ. A relatively heavy infestation of *Chermes* on Weymouth and Scots Pine in the Bagshot area, south of Windsor, was practically wiped out by these predators in a few years.

Several consignments of the predators were therefore collected and despatched to New Zealand and Canada, and in the latter country, one of them (*Leucopis obscura*) is known to have become established. During the last financial year, three lots of the ladybird *Exochomus quadripustulata*, comprising 3,700 specimens, and one lot of 2,141 eggs of the predacious

Neuropteron, *Hemerobius stigma*, obtained from females kept in cages in the Laboratory, where shipped to Canada. The results of these shipments are not yet known.

THE PINE SHOOT MOTH (*Rhyacionia buoliana, Schiff.*)

This is a small moth belonging to the Tortrix Family. Its larvæ attack several species of Pine and frequently cause serious damage, especially in young plantations, by boring into and destroying the tips of the young shoots. When the terminal shoot is affected, as it often is, the replacement of the original leader by a side shoot follows, and this causes a more or less pronounced kink or bend in the main stem, which often persists throughout the life of the tree and very seriously lessens the market value. The Pine Shoot Moth is a European insect but was accidentally imported into the United States and Canada a number of years ago.

Parasites of this species, obtained from material collected in English pine plantations, were first sent to Canada in 1928. Several species then introduced have become established, but as the pest continues to give trouble, the Dominion Entomologist requested further material.

Work on this species was carried out on a fairly large scale during the last financial year. Six consignments of material, comprising 219,600 specimens of larvæ or pupæ of the moth, of which a large proportion was attacked by parasites, were sent to Canada and arrived in good condition.

In 1935, a parasite of the Pine Shoot Moth was introduced from Austria into England, where the moth is sometimes a major pest in spite of its numerous natural enemies. The parasite selected was a small Chalcid, *Copidosoma geniculatum*, which is known to be very effective in Austria, but has never been found in England. Funds sufficient for a small collection of material were provided by the Forestry Commission and a colony of *Copidosoma* was liberated in an infested pine area near Dorchester. Arrangements have been made for the continuation of the work with this parasite and another promising Austrian Chalcid, during the coming financial year.

WHITE SPRUCE SAWFLY (*Diprion polytomum*, Htg.)

The Spruce Sawfly is by far the most serious pest that has ever appeared in the Canadian forests. It is a European species, fairly widely distributed, but though a few outbreaks have been recorded, it is normally uncommon and of no practical importance. In 1930 it was found to be abundant in the Gaspé Peninsula, south of the St. Lawrence River in Canada. Studies made by the Canadian entomologists indicate that the sawfly had been present for a good many years before it was discovered. It spread rapidly, increasing in numbers and now occurs over an area of more than 7,000 square miles in the Provinces of Quebec and New Brunswick. Its larvæ feed on the needles of both Black and White Spruce. As a result of the defoliation, which has been practically complete over large areas, great numbers of trees have died. An outbreak of the bark-beetle *Dendroctonus piceaperda*, whose attack was favoured by the weakness of the trees, due to defoliation, caused additional injury. It now seems probable that both the White and Black Spruce will be entirely destroyed in the Gaspé and there is at present no reason to think that it will be less injurious to Spruce in other areas.

The cost of the mechanical and chemical methods of control usually employed against defoliating insects is, in this case, prohibitive. The only hope of controlling the Sawfly lies in the introduction of the natural enemies that attack it in its native home. Early in 1932 the Dominion Entomologist therefore requested the Laboratory to take up the study of the insect and its parasites, and as adequate funds for the purpose have been provided, large-scale collections have been carried on in every season since that time. The work has been in charge of Dr. K. R. S. Morris, assisted by Messrs. W. F. Jepson, E. Cameron, and J. Eliot Moss and has been conducted mainly in Central and Northern Europe.

The investigations made on the Spruce Sawfly were extended in subsequent years to closely allied species, such as the Pine Sawflies, and it was found that many of the parasites of the Spruce Sawfly could be obtained in large numbers and at a lower cost from them. Since the beginning of the work over a million parasites, belonging to a number of species, have been introduced into the infested areas. During the last financial year six consignments of cocoons of the Spruce Sawfly, comprising 54,985 specimens and fifteen consignments of a Pine Sawfly, comprising

2,107,250 specimens and including both eggs and cocoons, were despatched to Canada. In this season parasites were discovered for the first time in the eggs of the Pine Sawfly. There is no apparent reason why they should not attack the eggs of the Spruce Sawfly, and if they do, they should be extremely valuable since egg parasites kill the host before any damage is done.

According to the latest reports, six or seven of the introduced parasites have been recovered from the areas where they were colonised. Several seem to have become definitely established and are increasing in numbers. The prospects of eventual success are good, for although the parasites cannot now save the heavily damaged trees they may be able to check the increase toward the outer borders of the infested areas.

Pine Sawfly infestations sometimes give trouble in England. A colony of an important Continental parasite, *Microplectron fuscipennis*, comprising 5,300 specimens, was therefore introduced this season into the Norfolk plantations and another, comprising 2,000 specimens, into plantations at Inverness.

Holly Leaf Miner (*Phytomyza ilicis*, Curt.)

The Holly Leaf Miner is, in the adult stage, a small inconspicuous fly, which lays its eggs in the midrib of the leaf of Holly, in which the larva feeds, eating out the parenchylna so as to make an irregular blotchlike " mine " between the upper and lower surfaces. These miners disfigure the leaf and spoil the appearance of the foliage. In England the Holly Leaf Miner is moderately common, but of little importance, but in British Columbia, where Holly grows well and is extensively planted both for its ornamental value and to provide material for Christmas decorations, the pest is a rather serious nuisance.

Preliminary investigations made some years ago showed that the Leaf Miner is attacked by parasites in England. During the past financial year these investigations were resumed and the information necessary for the selection of parasites for export to Canada, was obtained. A report, prepared by Mr. E. Cameron, containing the results of the work was sent to the Dominion Entomologist at Ottawa.

Pine Bark Beetles (*Myelophilus piniperda*, L.)

The Bark Beetles form an extremely important group of insects affecting trees of all kinds. The damage they do is due to the fact that the adults and larvæ tunnel through the cambium. They confine their attack for the most part to injured or dying trees, but sometimes successfully attack healthy trees.

The most important of the Pine Bark Beetles is *Myelophilus piniperda*, L. This insect sometimes causes serious damage in the larval stage, but is particularly injurious also as an adult, owing to its habit of boring in the pith of the young shoots, which fall off in large numbers. The resultant defoliation weakens the tree, which then becomes suitable as a breeding ground for the beetles and may eventually succumb to their attacks. Furthermore, the destruction of the terminal shoot by the adult beetle frequently has a result similar to that noted in the case of the Pine Shoot Moth. The lost terminal shoot is replaced by a side shoot. A more or less pronounced bend or kink thus forms in the main stem and this may persist throughout life, greatly reducing the value of the tree.

Bark beetles are admittedly difficult to control. In 1931, we began an investigation of their natural enemies with a view to their introduction into New Zealand and South Africa, where imported species of this group do a good deal of damage. The work was placed in charge of Mr. H. S. Hanson, who found that the parasites and predators of Bark Beetles are much more important than has been realised, and, after some preliminary studies, put forward the suggestion that it might be possible to develop methods of forest management disadvantageous to the beetle and advantageous to its controlling agents. Plans for an investigation on the subject were submitted to the Forestry Commission, which eventually decided to provide facilities for the work in the areas under their control and supplemented these, in 1934 and 1935, by a grant partially covering the cost of the investigation to the Laboratory.

The work carried out by Mr. Hanson has enabled us to form a reasonably clear idea as to the genesis of the outbreaks of the Pine Bark Beetle and the measures necessary for its control.

All the evidence goes to show that the pine forests harbour a permanent population of the Pine Beetle, which may not, in itself, cause great damage, but is sufficient to be be the source of an outbreak, whenever conditions occur allowing the insects to realise their potential reproductive capacity. Under what may be called normal or balanced conditions, the beetle is kept in control, partly owing to the limited supply of breeding material and the overcrowding thus produced, partly owing to the activity of the parasites and predators, which tends to its maximum when the host population is concentrated in a few stems.

On the other hand, when numerous trees pass rapidly into the sickly condition where they are suitable breeding material for the beetle, outbreaks tend to occur. Beetles now find suitable unoccupied trees more easily; mortality through overcrowding diminishes. To keep pace with the increase the parasites and predators must move through unoccupied areas to other trees containing hosts so that their efficiency tends to fall off. The initial advantage gained by the pest enables it to increase fairly rapidly for a considerable period, after which the parasites and predators, favoured by the high density of the host population, and assisted in their work by the factor of overcrowding, bring the outbreak to an end. But when events are allowed to take their course, serious damage inevitably results. It is better to avoid the conditions by which outbreaks are engendered. The investigations made show that these may occur either through the effect of such catastrophic agencies as fire or storms, causing windfalls, or, as a normal result, in rapidly growing stands in which numerous trees are rapidly suppressed by their neighbours.

It is evident that the removal of material in which the insects can breed, if carried out with sufficient thoroughness, at the proper time, should prevent Pine Beetle outbreaks. This fact is, no doubt, the basis of the strong recommendations of " clean forestry " put forward by the older school of forest entomologists, whose information in regard to the natural enemies was inadequate. It is clear that the cost of the operations necessary to " clean forestry " is, in many cases, prohibitive, and that unless they are very generally adopted, Bark Beetle damage will continue to occur owing to migrations from neglected areas. A more comprehensive study of the problem shows that radical measures may be necessary after fires and windfalls, a more rational and less expensive treatment based on an exact knowledge of the habits of the insects and their natural enemies, can be adopted in stands in which normal conditions prevail.

A full report on the results of this work, and containing practical recommendations framed with regard to the various conditions found in pine stands, is now being prepared for publication.

The consignments of the natural enemies of Bark Beetles shipped to Canada and New Zealand, arrived in good condition and were duly released in infested areas. The results of the experiment are not yet known, but the Entomologist of the Cawthron Institute in New Zealand reported that the predators sent lay their eggs in the burrows of the introduced bark beetles, and feed readily in both the larval and adult stages, on the eggs and larvæ of the pest.

INSECTS AFFECTING GARDEN CROPS

Cabbage Caterpillars (*Pieris rapæ*, L.)

This pest of cruciferous crops is of European origin. In 1930 it appeared in the Hawke's Bay district of New Zealand, and by 1933, says the Dominion Entomologist (N.Z. Journal of Agriculture, vol. 51, p. 109, 1935), " was to be seen in millions flying over the road-sides and pastures, and as a white fluttering cloud over every cruciferous crop in and around Hastings." So abundant were the butterflies that in certain areas it was difficult to drive a car through the clouds that swarmed before the headlights.

Several consignments of the two principal parasites of the pest, collected and reared by Mr. J. Eliot Moss, were despatched to New Zealand from 1931 to 1934. They soon became established. By 1934–35 the pest was virtually brought under control in the Hawke's Bay area, where the first liberations were made. By the winter of 1935 a similar result had been obtained in the Manawatu-Martin district. In a survey of this area, 21,881 pupæ of the butterfly were collected and of these no less than 20,940, or 96 per cent., were found to be parasitised. " No doubt," writes the Dominion Entomologist, " the white butterfly will always be with us, but

the parasite has checked effectively the widespread ruin that inevitably would have occurred in the most important of our cabbage crops—the brassicas." It should be noted also that none of the native parasites or predators showed any signs of ability to cope with the pest. For example, in one area in which the imported parasites had not been liberated, 19,567 pupæ were collected; but not a single specimen was parasitised.

The introduction of the parasites of the Cabbage Caterpillar into New Zealand may thus be fairly ranked among the outstanding successes obtained in work on biological control.

THE DIAMOND BACK MOTH (*Plutella maculipennis*, Curt.)

The caterpillar of this small moth is a widespread pest of crucifers, but is apparently of European origin. It is a troublesome pest in New Zealand on behalf of which a preliminary investigation was carried out during the past year, at the request of the Dominion Entomologist. In every region where it has been carefully studied, it is attacked by parasites belonging to the hymenopterous genus *Angitia*. The species of this genus are closely related and difficult to separate. It was therefore found necessary to carry out a careful study of speciments from various regions in order to make certain that the species attacking the Diamond Back Moth in Europe do not already exist in New Zealand. The investigation, made by D. C. Lloyd, shows that though the species of *Angitia* are very similar and may, under certain circumstances, interbreed, producing progeny whose characteristics are puzzling even to the expert, yet it is possible to distinguish several distinct forms of which some, at least, differ clearly from the one found in New Zealand. It seems probable that the morphological differences correspond to constitutional or physiological differences, including differences in distribution. Slight alterations in habits may have great effects on the efficiency of a parasite as a controlling agent.

The introduction of the European parasites of the Diamond Back Moth into New Zealand can therefore be recommended and will be initiated, if possible, in 1936.

INSECTS AFFECTING GREENHOUSE PESTS

GREENHOUSE WHITEFLY (*Trialeurodes vaporariorum*, West.).

Several requests for *Encarsia formosa*, the parasite of the Greenhouse Whitefly, have been received and transmitted to the Experimental Station at Cheshunt, where large-scale breeding of the parasite is carried on.

MEALYBUGS (*Pseudococcus* spp.).

The Mealybugs are allied to scale-insects. They are very injurious in tropical and subtropical countries as pests of a number of plants, such as Citrus fruits, coffee, and grapes. In temperate climates they are troublesome as greenhouse pests.

The predacious Australian ladybird, *Cryptolaemus montrouzieri*, was bred for some years in the Laboratory for distribution in English greenhouses infested with Mealybug; but, as stated in the last report, the Ladybird was not found to be a satisfactory controlling agent, probably because of the adverse conditions that prevail in ordinary greenhouse practice. Breeding operations were therefore discontinued. A consignment of the Ladybird was despatched to the West Indies for liberation in the island of Montserrat, where Mealybug is a pest of Citrus; but the results are not yet definitely known.

TROPICAL WORK

Correspondence in regard to biological control work in the tropics has been carried on with the entomologists of India, Kenya, the West Indies, Mauritius, Fiji, and Malaya. Advice was also supplied concerning the organisation of work on the biological control of Coconut Scales in the Seychelles; the recommendations put forward some years ago in regard to this work by the Laboratory, have been accepted by the Colonial Office, which has begun an investigation, now in charge of Mr. Vesey-Fitzgerald, who spent several months as a Colonial Office Scholar at Farnham House Laboratory, before proceeding to the West Indies.

During the past year, Mr. W. F. Jepson, seconded from the Laboratory to the Government of Mauritius, has carried out, in the Far East, an extensive search for parasites and predators

suitable for use against *Lachnosterna smithi*, the white-grub of Sugar-cane, and has despatched large numbers of many species to Mauritius, where colonisation of the natural enemies is being rapidly carried on.

In the West Indies, Dr. J. G. Myers, formerly of the staff of the Laboratory, has continued his work on various important pests, devoting special attention to the parasites of the Large Moth Borer of Sugar-Cane (*Castnia licoides*). Mr. L. D. Cleare and Mr. H. E. Box have continued in association with Dr. Myers, their work on imported parasites of the Small Moth Borer of Sugar-cane (*Diatraea saccharalis*), which has given, in the Leeward Islands and British Guiana, distinctly satisfactory results.

INSECTS ATTACKING NOXIOUS WEEDS

RAGWORT (*Senecio Jacobaea*, L.).

Mr. E. Cameron's paper on the natural control of Ragwort, containing a detailed analysis of the factors on which the abundance of this weed depends and comprising 57 pages of text, 2 plates and 11 figures, appeared in the "*Journal of Ecology*" for August, 1935.

A consignment of 7,000 specimens of the Ragwort Seedfly (*Pegohylemyia seneciella*, Meade) was despatched to New Zealand.

AUSTRALIAN INVESTIGATIONS

Mr. S. Garthside, of the Australian Entomological Service (C.C.S.I.R.), assisted by Mr. H. T. Rosenberg and Mr. F. Wilson, continued his investigations on the natural enemies of a number of noxious weeds and insect pests. Mr. Wilson is now carrying on a branch of this work at Hyères, S. France. During the past financial year, Mr. Garthside and his assistants have despatched to Australia, 19 consignments of beneficial insects, comprising 31,814 specimens.

MISCELLANEOUS

A consignment of the egg-parasite, *Trichogramma*, was despatched at his request, to Professor Escherich, of the University of Munich, Germany, to provide a stock for experimental work. The material arrived in good condition.

RESEARCH AND PUBLICATIONS

In addition to the investigations directly required by the various projects, research work was carried on at the Laboratory by independent workers: Mr. G. C. Ullyett, formerly entomologist to the British Empire Cotton Growing Corporation, Miss Marjory Walker, of the University of St. Andrews, and Mr. D. C. Lloyd, of the University of Wales, Aberystwyth, carried out population studies on several types of parasites. Mr. Oswald Peck, of MacGill University, Montreal, concluded his researches on the anatomy of the Ichneumonids and returned to Canada at the end of November, to take up a position in the taxonomic department of the Canadian Entomological Branch. Mr. L. D. Cleare of British Guiana, during a period of leave in England, spent several weeks at the Laboratory on studies of the larval stages of an important Tachinid parasite of the Small Moth Borer of Sugar-cane.

Five papers, comprising 118 pages, 3 plates, and 22 figures, dealing with various aspects of the work were published during the year by various members of the staff.

VISITORS

Many visitors from overseas have come to the Laboratory to inspect its work or discuss the problems of biological control during the past year. Among these were the Prime Minister of New Zealand, the Director of Research of the Canadian Department of Agriculture (Dr. J. M. Swaine), the chief Entomologists of Canada and South Africa, and members of entomological or teaching staffs from Great Britain, Australia, South Africa, India, the British Colonies, and the United States of America. On 25th September, the Delegates to the Fourth Imperial Entomological Conference visited the Laboratory, where they saw a film prepared

by Dr. K. R. S. Morris, showing various aspects of the practical work on the parasites of the White Spruce Sawfly. One of the meetings of the Fourth Imperial Entomological Conference, opened by the Superintendent of the Laboratory, was devoted to a discussion of the problems of biological control, including the work of Farnham House. As stated in the Report of the Conference, the Committee of the Conference (Appendix Ia, par. 17) supported the continuance of Farnham House as required by the entomologists of the Empire, and recommended (par. 19) that its finances be framed on a five-year basis.

STAFF

No changes in the technical staff have been made since the date of the last report. Including non-technical members, the staff now numbers eleven.

LIBRARY AND EQUIPMENT

The library now includes 647 bound volumes and 3,726 separates. No equipment of importance has been purchased during the year.

PARASITE CATALOGUE

Work on the Parasite Catalogue, which shows all records of parasites and predators, their hosts, and the country of record, as shown in the "*Review of Applied Entomology*," Series A and B, and other entomological publications, has been continued by Mr. R. C. Jeffery.

APPENDIX XII

PUBLICATIONS

1. ANNUAL REPORTS OF THE EXECUTIVE COUNCIL OF THE IMPERIAL AGRICULTURAL BUREAUX:

	s.	d.
FIRST REPORT: 1929–30	1	0
SECOND REPORT: 1930–31	1	0
THIRD REPORT: 1931–32	1	0
FOURTH REPORT: 1932–33	1	0
FIFTH REPORT: 1933–34	4	0
SIXTH REPORT: 1934–35	4	0
SEVENTH REPORT: 1935–36	5	0

2. LIST OF AGRICULTURAL RESEARCH WORKERS IN THE BRITISH EMPIRE, 1935. .. .. 2*s.* 6*d.*

Obtainable from the Secretary, Executive Council, Imperial Agricultural Bureaux, 2 Queen Anne's Gate Buildings, London, S.W.1, and from H.M. Stationery Office at the addresses shown on cover.

THE JOURNAL OF DAIRY RESEARCH

Published by the Cambridge University Press on behalf of the Committee of Management. First issued in November, 1929.

	s.	d.
VOLUMES I to IV (each two parts) .. .. .. volume	25	0
Single parts .. .. each	15	0
VOLUME V to VII (each three parts) .. .. volume	25	0
Single parts .. .. each	10	0

PUBLICATIONS ISSUED BY THE IMPERIAL INSTITUTE OF ENTOMOLOGY, 41, QUEEN'S GATE, LONDON, S.W.7

Bulletin of Entomological Research.

Published quarterly, and containing original articles on Economic Entomology. Issued post free.

	s.	d.
Annual Subscription (payable in advance)	30	0
Subscription to current volume received after 30th June	36	0
Separate parts	9	0
Back Volumes:— I (1910)-X	20	0
XI (1920)-XXIII (1932)	25	0
XXIV (1933) *et sqq.*	37	6
Bound Volumes (extra to above prices)	6	0
Binding cases only	3	6

Reprints of some of the papers published in this Journal are available. Prices on application.

Review of Applied Entomology.

Consisting of abstracts or reviews of all current literature on Economic Entomology throughout the world. Published monthly in two series :—

Series " A " dealing with insect and other Arthropod pests of cultivated plants, forest trees and stored products of animal and vegetable origin.

Series " B " dealing with insects, ticks, etc., conveying disease or otherwise injurious to man and animals. Issued post free.

	Series " A."		Series " B."	
	s.	*d.*	*s.*	*d.*
Annual Subscription (payable in advance)	30	0	15	0
Subscription to current volume received after 30th June	36	0	18	0
Separate parts	3	0	1	6
Annual Subject Index (when sold separately)	6	0	3	0
Subject Index—Vols. I-III	5	0	I-X 10	0
Back Volumes—Vol. 1 (1913)-VII	15	0	10	0
Vol. VIII (1920)-XXII (1934)	24	0	12	0
Vol. XXIII (1935) *et sqq.*	42	0	21	0
Bound Volumes (extra to above prices)	5	0	5	0
Binding cases only	3	6	3	6

The index to the current volume is not published until April (Series " B ") or August (Series " A ") of the following year.

Zoological Record—Part Insecta.

Published annually about July in each year and containing as complete a record as possible of the literature of the previous year, chiefly from the systematic standpoint.

	s.	*d.*
Annual Subscription (including postage)	15	6
Back Volumes :— Vols. LII (1915)-LVII (1920)	12	0
Vols. LVIII (1921) *et sqq.*	15	0

Postage extra.

Some of the Sections into which Volumes LXI–LXVII were divided are still available. Prices on application.

An Abstract of the Legislation in Force in the British Empire Dealing with Plant Pests and Diseases up to the Year 1920.

By E. Marguerite Ralfs, B.A. Med. 8vo. 65 pp. Paper Covers. Price, 2*s.* 6*d.* 1921.

Tsetse-Flies. Their Characteristics, Distribution and Bionomics, with some account of possible Methods for their Control.

By Major E. E. Austen, D.S.O., and Emile Hegh. Med. 8vo. 188 pp. With 5 plates and 19 figures. Paper Covers. Price, 7*s.* 6*d.* Postage 4*d.* extra. 1922.

The Phases of Locusts in South Africa.

By Prof. J. C. Faure. Roy. 8vo. 132 pp. Paper covers. With 6 coloured, 19 black-and-white plates and 1 map. Price 12*s.* (Reprinted from the Bulletin of Entomological Research, Vol. XXIII, Pt. 3. September, 1932.)

Locusts and Grasshoppers. A Handbook for their Study and Control.

By B. P. Uvarov. Imp. 8vo. Pp. xiii and 352. With 9 plates and 118 text figures. Bound in Buckram. Price 21*s.* net. Postage, inland, 7*d.*; abroad, 1*s.* 3*d.* 1928.

The Coconut Moth in Fiji. A History of its Control by means of Parasites.

By J. D. Tothill, D.Sc., T. H. C. Taylor, B.Sc., and R. W. Paine, B.A. Containing a full account of the successful campaign against this important coconut pest. Imp. 8vo. Pp. vi and 269. With 12 coloured and 22 black-and-white plates, 1 map, and 121 text figures. Bound in Buckram. Price, 31*s.* 6*d.* net. Postage, inland, 7*d.*; abroad, 1*s.* 3*d.* 1930.

A List of the Entomologists Employed in the British Empire.

Prepared for the Third Imperial Entomological Conference, 1930. Med. 8vo. 16 pp. Paper covers. Price, 2*s.* 6*d.* 1930.

A Summary of Data Relating to Economic Entomology in the British Empire.

Prepared for the Third Imperial Entomological Conference, 1930, by S. A. Neave, M.A., D.Sc. Med. 8vo. 24 pp. Paper covers. Price, 2*s.* 6*d.* 1930. (At present out of print.)

Report of the Third Imperial Entomological Conference, 17th–27th June, 1930.

Med. 8vo. 59 pp. Paper covers. Price, 2*s.* 0*d.* 1930.

Report of the Fourth Imperial Entomological Conference, 19th–27th September, 1935.

70 pp. Roy. 8vo. Paper covers. Price, 4*s.* 0*d.* 1935.

Orders may be sent direct to the Assistant Director, Imperial Institute of Entomology, 41, Queen's Gate, London, S.W.7, or through a bookseller.

PUBLICATIONS OBTAINABLE FROM THE IMPERIAL MYCOLOGICAL INSTITUTE, KEW, SURREY

Journal

Review of Applied Mycology.

	s.	*d.*
Annual Subscription, 12 monthly parts, with title-page and index (post free)	21	0
Single part	2	0
Title-page and index	3	0

Back volumes (with the exception of Vols. I, VII and VIII, which are out of print) can be supplied, postage extra.

Occasional Publications

Annotated Account of Fungi Received at the Imperial Mycological Institute.

	s.	*d.*
List I	1	0
List II, Fasc. 1	1	0
List II, Fasc. 2	5	0

Report on the Third Imperial Mycological Conference, 1934.	2	0
Mycologists resident in the British Empire, 1932	2	0

PUBLICATIONS OF THE IMPERIAL AGRICULTURAL BUREAUX

I. Obtainable from the Imperial Bureau of Soil Science, Rothamsted Experimental Station, Harpenden, Herts.

Periodical Abstracts

Lists of publications and papers on Soil Science published in the Empire Overseas in :—

	s.	*d.*
1930	1	0
1931	1	0
1932	1	0
1933	1	0
1934	1	0

(The list for 1929 is out of print.)

Soil Research in the British Empire published during 1935	1	0

Lists of Publications relating to Soils and Fertilisers—

Published monthly, per annum, post free	10	0

Monthly Letters :—

Free to recipients, within the British Empire, of " Publications relating to Soils and Fertilisers." Subscription, outside the Empire, per annum	4	0

Recent Developments in Soil Analysis—

Quarterly Supplement to the above publications. Separate copies, each	0	6

Occasional Papers

Technical Communications.	s.	d.
7. Methods of taking Soil Profiles	0	6
10. The Arrangement of Field Experiments and the Statistical Reduction of the Results (by R. A. Fisher and J. Wishart)	1	0
11. Note on an Area of Alkali Land in Western Australia	0	6
14. Weights and Measures occurring in Agricultural Publications of the Empire Overseas	0	6
17. Proceedings of a Conference on Soil Science Problems, September, 1930	1	6
19. Air Survey in relation to Soil Survey (by R. Bourne)	1	0
20. Lucerne "Inoculation" and the Factors affecting its Success	1	6
21. Summaries of Papers read at the Sixth International Congress of Tropical and Sub-tropical Agriculture, Paris, 1931	0	6
23. The Reclamation of Alkali Land in Hungary (A. A. J. de'Sigmond)	1	6
24. Laterite and Laterite Soils	2	0
25. The Mitscherlich, Wiessmann and Neubauer Methods of Determining the Nutrient Content of Soils (by R. Stewart)	2	0
26. The Dispersion of Soils in Mechanical Analysis	2	0
27. Land Amelioration in Germany (by H. Janert)	2	0
28. Soil Erosion (by T. Eden)	2	0
29. Soil, Vegetation and Climate	2	0
30. The Determination of Exchangeable Bases in Soil	2	0
31. Soil Deficiencies and Plant Diseases	2	0
32. Tea Soils (by H. H. Mann)	2	0
33. Organic Manures (by S. H. Jenkins)	2	0
34. Tropical Soils in relation to Tropical Crops	2	6
Annual Report: For the year 1929–30	0	6
" " 1930–31	0	6
" " 1931–32 (out of print)	0	6
" " 1932–33	0	6
" " 1933–34	0	6
" " 1934–35	0	6
Bibliographies.		
Bibliography on Sisal (out of print)	1	0
Bibliography on Tobacco	2	0
Bibliography on Coffee	2	0
Catalogue of Journals and Periodicals in the Library of Rothamsted Experimental Station	2	0
Special Publication.		
The Katamorphism of Igneous Rocks under Humid Tropical Conditions (by the late Sir J. B. Harrison)	5	0
Bibliography of Soil Science, Fertilizers and General Agronomy, 1931–34	25	0

II. Obtainable from the Imperial Bureau of Animal Health, Veterinary Research Laboratory, New Haw, Weybridge, Surrey.

Abstracting Journal

The Veterinary Bulletin.	s.	d.
1931. Vol. 1. Quarterly (1st Number, April)	7	6
Annual Subscription	20	0
Subsequent Volumes. Monthly (1st Number, January)	5	0
Annual Subscription (postage paid)	40	0

(Back Numbers still available.)

Indexing Publication

Index Veterinarius—Four issues a year. First issue April, 1933. Annual Subscription (postage paid). Volumes I to III mimeographed, Volume IV onwards, printed	100	0

Back numbers are still available.

III. Obtainable from the Imperial Bureau of Animal Nutrition, Rowett Research Institute, Bucksburn, Aberdeen.

Journal

	s.	d.
Nutrition Abstracts and Reviews. (Issued under the direction of the Imperial Agricultural Bureaux Council, the Medical Research Council and the Reid Library.)		
Subscription per Volume of 4 numbers	42	0
Per single number	13	0

Occasional Papers

Technical Communications.		
1. A. I. V. Silage	0	6
3. Recent Research on Forage Crop Cultivation, Fodder Conservation and Utilisation, at the Animal Breeding Institute of the University, Konigsberg	1	0
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6. The Composition of Certain African Foods and Feeding Stuffs	1	0
7. Wheat: Pre-eminence as a Cereal Food, Nutritive Value; Relation to Health and Disease	1	0
OCCASIONAL COMMUNICATIONS.		
1. The Effect of Climate on the Composition of Pasture Plants	—	

IV. Obtainable from the Imperial Bureau of Plant Genetics (for crops other than Herbage), Plant Breeding Institute, School of Agriculture, Cambridge.

Journal

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Plant Breeding Abstracts.		
Quarterly. Annual Subscription	15	0
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Summary of Reports received from Countries exclusive of the British Empire, 1928–31 Supplement I	2	6
Summary of Reports received from Stations in the British Empire, 1932–35. Supplement II	5	0
Technical Communications.		
Plant Breeding in the Soviet Union. (Joint Publication of the Imperial Bureaux of Plant Genetics)	3	6
Vernalization and Phasic Development of Plants. (Joint Publication of the Imperial Bureaux of Plant Genetics)	10	0
The South American Potatoes and their Breeding Possibilities. (In Press.)		
Bibliographical Monographs.		
Wheat Breeding Bibliography. Part 1	1	6
,, ,, ,, Part 2	2	6
Breeding Varieties Resistant to Disease	2	0
Lodging in Cereals	0	6
Oat Breeding Bibliography	1	6
Rice Breeding Bibliography	1	6

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Rye Breeding Bibliography	1	6
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Breeding Resistant Varieties, 1930–33 (Supplement)	2	0
The Experimental Production of Haploids and Polyploids	5	0
The Production of Induced Mutations—		
I. by X-rays (*In Press*)		

V. Obtainable from the Imperial Bureau of Plant Genetics (Herbage Plants), Welsh Plant Breeding Station, Agricultural Buildings, Alexandra Road, Aberystwyth, Wales.

Journals

Herbage Abstracts.

Quarterly.

	s.	d.
Vol. 1 (1931), No. 3 only	1	6
Vol. 3 (1933), Vol. 4 (1934), Vol. 5 (1935), Vol. 6 (1936). Annual Subscription	15	0
Single numbers	5	0

Herbage Reviews.

Subscription is at present—Vol. 1 (1933), Vol. 2 (1934), Vol. 3 (1935), Vol. 4 (1936)—included in that to Herbage Abstracts.

Occasional Papers

Bulletins.

		s.	d.
3.	The Breeding of Herbage Plants: Technique adopted at the Welsh Plant Breeding Station. June, 1931	3	0
6.	Research on Forage Crops in Soviet Central Asia, with Special Reference to Turkestan Lucerne. March, 1932	1	6
7.	Further Contributions on the Technique Employed in the Breeding of Herbage and Forage Plants. May, 1932	2	0
11.	Technique Employed in Grassland Research in New Zealand. September, 1933	3	0
13.	Plant Breeding in the Soviet Union. November, 1933 (Joint publication of the Imperial Bureaux of Plant Genetics)	3	6
14.	Grassland Research in Australia. February, 1934	3	0
15.	Grassland and Forage Crops in Thuringia, Czechoslovakia and Hungary. August, 1934	3	6
17.	Vernalization and Phasic Development of Plants. December, 1935. (Joint publication of the Imperial Bureaux of Plant Genetics)	10	0

VI. Obtainable from the Imperial Bureau of Fruit Production, East Malling Research Station, East Malling, Kent.

Journal

Horticultural Abstracts. A quarterly abstract publication of current horticultural literature.	s.	d.
Vol. I. First issued, March, 1931. Nos. 2, 3 and 4, 3*s.* 6*d.*, or each	1	6
Vol. II. Nos. 1, 2 and 3 out of print. No. 4, single copy	1	6
Vols. III and subsequent volumes. Annual Subscription	15	0
Single copy	4	0

Horticultural Abstracts—*continued.*

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3.	Investigations on the Standardisation of Citrus Trees by Propagation Methods. 1932	2	0
4.	Problems of Fruit Tree Nutrition. Possible Lines of Approach. 1933. T. Wallace	2	0
5.	The " Degeneration " of the Strawberry. 1934. D. Akenhead, R. V. Harris, G. H. Berkeley, A. M. Massee	2	0
6.	The Nutrition and Manuring of Soft Fruits. 1936. T. Wallace	2	0
7.	Vegetative Propagation of Tropical and Sub-tropical Fruits. 1936. J. St. Clair Feilden and R. J. Garner	2	0

Occasional Papers

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